

**Breaking Ground by Breaking Bread: A Conciliatory Philosophical Inquiry
into the Debate over Industrial and Alternative Agricultures**

by

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Abstract

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Debates over agriculture often tie together many interdisciplinary threads and are prone to considerable conceptual confusion. Despite this philosophical ripeness and the overwhelming importance of the issues at stake, agricultural problems have received little philosophical airplay. Since philosophy's main bridge to issues regarding the human-nature relationship, environmental ethics, is mainly concerned with issues of how to ground nature's value independently of human artifice, it has tended to paint agriculture as inherently degrading. Those in search of an affirmative agricultural ethic have thus tended to draw more heavily from economics or agrarianism, giving rise to a highly polarized discursive environment. The aim of this thesis is to reconstruct and analyze two such positions, an institutional economic defense of industrial agriculture and an agrarian attempt to underpin alternatives. My first two chapters deal with arguments that favour industrial agriculture based on its production capacity and on its efficiency. In the first chapter, I reconstruct these arguments, uncovering and distinguishing normative and empirical assumptions about the operation of markets, the value of efficient production, and the connection between science, technology, and industrialism. My second chapter offers criticisms, concluding that such arguments cannot rule out agricultural principles, policies, and practices that incorporate social goals beyond efficient production. My third chapter reconstructs the main argumentative thread of Paul Thompson's agrarianism, which seeks to establish agrarian agriculture's political role as modeling properly socio-ecological sustainability. In my final chapter, I argue that we must dispense with agrarianism as an ideology that privileges rural experience, instead focusing on agrarians' communitarian and ecological insights. I end by offering a set of ideals that I hope can form the basis of a less polarized, more constructive discussion about how to manage our food system.

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Introduction

“When we are pressed up against our natural limits – the planet’s biocapacity – we need to ask serious questions about what we need”¹

The debate about the industrial food system has hit the mainstream. In fact, popular discourse seems to be its principle arena. A quick look at the conversation, particularly as it plays out in the media and popular, public literature, yields two strident voices: defenders of industrial agricultural progress and a hodgepodge community of detractors who support a variety of ‘alternative’ agricultures. Despite the partisanship and vehemence with which this debate often proceeds – ‘progressives’ calling their detractors xenophobes, romantics, and anti-science zealots, and ‘greens’ making accusations of greed, callousness, short-sightedness, and technocracy – the battle lines are not at all obvious or clear. Distinctions between the two agricultural systems are often expressed in terms of for and against positions on industrial technologies. Advocates of organic, ecological, or biodynamic farming are against GMO’s, ‘synthetic’ pesticides, ‘chemical’ fertilizers, and the factory farming of animals. Industrial farmers embrace these products and techniques, when deemed safe by government regulators, as helpful tools for the production of more, cheaper food and fibre commodities. Seen in this light, the debate often operates with a distinction between agricultural system that highlights organizational and technological aspects of the agricultural systems: industrial agriculture (hereafter referred to as IA) is centralized, specialized, large-scale, low-labour, high input, and highly mechanized. Alternative agricultures are localized, decentralized, small-scale, labour-intensive, ecologically-minded, and more self-sufficient.

But these pictures obscure important technological and organizational overlaps and gradations that call the fixity of this distinction into question (See Rigby and Caceres 2001). For one, even small ‘alternative’ farms have had their productive capacities considerably augmented by ‘industrial’ technologies² such as the internal combustion engine, improved germplasm, the electricity grid, computers, modern metals and plastics, and a variety of fertility augmentation products (e.g. rock phosphate, bloodmeal, bonemeal, agricultural lime, etc.) and pest control

¹ (Williston 2012, 361).

² Advocates of organic agriculture will balk at my calling some of the products I list ‘industrial.’ Many soil augmentation and pest control products, they may claim, have been used for thousands of years. However, the point here is that even those products and techniques for which this is true, their availability in large quantities at low prices is today due to their production in industrial-scale facilities that are highly mechanized.

products (e.g. BT toxin, pyrethrin, lime sulfur, sabadilla, rotenone, etc.), among other things. Moreover, given the observation that any farming practice, however sensitive to local ecologies, disrupts wild ecosystems to some degree, and that no farm is or likely could be an entirely closed system, the self-sufficiency and ecological harmony of alternative agriculture is separated from industrial practices by a matter of degrees.

To find a more robust distinction, then, we must perhaps look less to technological and organizational principles and more to philosophical ones. Here, we see advocates of the alternative agriculture movement as focused on environmental and social values that they see as neglected or contravened by the industrial system. Advocates of the industrial system tend to focus on the benefits of greater production in terms of its contributions to the fulfillment of human rights entitlements and the augmentation of subjective welfare. Members of the alternative agricultural community focus, for example, on the need for farms to build fertility, biodiversity, and local community. ‘Sustainability’ has become a central conceptual nexus around which this debate proceeds, and in terms of which both sides stake out their claims.

However, though a considerable literature on the concept of sustainability has amassed in fields like ecology, conservation biology, economics, agronomy, and environmental ethics, little dedicated *philosophical* attention has been paid to the debate as it pertains to agricultural ideologies and practices. This poses a serious problem for the public debate over IA. This is because varying concepts of sustainability come from academic contexts whose applications to agriculture are not immediately obvious or unproblematic. Moreover, sustainability is a value-laden notion in several important ways. First, it requires that we delineate systems and functional elements³ thereof. Since natural, social, and political systems interact in a hugely complex variety of ways, there are myriad ways in which we may partition off systems; in other words, drawing boundaries is always done for a particular purpose. The merit of this purpose, as well as the aptness of the boundaries and functional groupings for it is always open to question. Second, in order for a claim about sustainability to be made, some system property or set of properties must be chosen as the thing(s) to be sustained. This is a fundamentally normative choice: reasons

³ By ‘functional elements’ I refer to the way in which dependent and independent variables are categorized and related: sometimes they are objects and causes taken from physics, chemistry, or biology. Other times, they are people, social influences, reasons, emotions, and psychological impulses. Often, they integrate animals, plants, selective pressures, behavioural pathways, and group dynamics with biogeological processes. An element takes on a ‘functional’ valence once it is seen to contribute, in some way, to the maintenance of a capacity of the system as a whole.

must be given to prefer a conception of sustainability that does not include a massive reduction in human population or that promotes ecologies more closely resembling pre-colonial times. Third, since nature is in a constant state of change, sustainability must be defined in terms of thresholds specifying the magnitudes of the change, the length of time over which it should occur, and the acceptable rate at which it should occur. Preferring some historical set of magnitudes, time horizons, and rates of change (of climate change, say) relies on our values.

Agricultural sustainability poses problems for biological, economic, and sociological conceptions of sustainability because it is a culturally significant practice in which production must be reconciled with the conservation and preservation of valuable natural processes. On the farm, ecology, economics, and culture come together and must find some reconciliation. Agricultural activity vitiates the *prima facie* ethical separation of nature and humanity. Conservationists and preservationists often seek to keep land and habitat from being despoiled by agriculture, but agriculturalists are focused more keenly on the way in which natural processes that are of particular value to human beings can be augmented and controlled. The problem of sustainability, through the lens of agriculture, becomes more complicated than the question as to which natural areas to preserve, how much pollution to permit, and what resources to conserve, though these questions remain of central importance. An adequate agricultural ethic demands that we examine our relationship with nature through economic, sociological, *and* ecological lenses simultaneously. Philosophical thinking about agriculture, therefore, offers the opportunity to conceive of sustainability in terms general enough that it may yield a theoretical approach applicable to many other contexts. This is because the conversation about agricultural sustainability is not simply a question of how long particular production practices can last given a certain stock of resources, or what parcels of land to set aside to ensure that future generations have enough resources, or how to ensure the ongoing existence of pristine wilderness. In agriculture, these questions come together. And the result of a lack of ethical clarity can be seen in the proliferation of technical definitions of sustainability – Jacobs (1995) distinguishes 386 (in Rigby and Cáceres 2001) – that are often rolled out as the true definitions of sustainability at the expense of an explicit discussion of the ethical assumptions that make various of these definitions appealing under different kinds of circumstances. Debates over IA often devolve into shouting matches about what is and is not sustainable when divergent conceptions of

sustainability are confused under the same name. Hence, the application of this notion to agriculture requires some philosophically heavy lifting.

Outline

My introductory remarks are meant to display the ethical hole in concepts of sustainability into which opponents and proponents of IA often fall: their remarks about sustainability often come from different conceptual roots and lack clear and comprehensive applicability to agriculture. In such a context, terminological disagreements can proliferate needlessly, values can seem to conflict when they are perfectly continuous, and constructive discourse can be replaced with partisan factions who entrench themselves in a narrow set of values that they see as in need of defense or promulgation in the face of others. This kind of discursive climate is worrisome considering the importance of agriculture for addressing environmental problems on account of the scope and impact of its land use: it creates at least 35% of all greenhouse gas emissions;⁴ it currently uses 38 percent of the globe's land surface (excluding Greenland and Antarctica) accounting for the destruction or radical alteration of 70% of grasslands, 50% of savannas, 45% of the temperate deciduous forest, and 25% of tropical forests; it uses 70% of all fresh water that we draw, and 80 to 90% of all water that is consumed without being returned to the watershed; it has nearly doubled nitrogen and phosphorous flows since the 60's, contributing to massive water pollution problems as well as global climate change; and because of all these impacts, agriculture is the among the biggest drivers of global biodiversity loss (Foley 2011, 62-3).

The broad aim of this thesis is to examine two of the most well-developed ethical positions on agricultural sustainability. My intended audience is anyone who has been tempted to take for or against positions on industrial agriculture. My hope is to advance what I see as a highly necessary but largely neglected portion of environmental ethics: agricultural ethics. I find that even more philosophical treatments of the debate over IA are plagued with considerable unclarity and partisanship. My task, therefore, will be largely clarificatory and conciliatory. My aim will be to work towards a set of shared ideals that can form the basis of collaborative discussion on how to formulate and address modern environmental and social problems related to agriculture. The thesis is, admittedly, philosophically preliminary, working to begin clearing the air in what are sometimes quite broad strokes. My hope is to highlight sticking points with

⁴ More than the entire global transportation system or all electricity generation (Foley 2011, 63).

enough clarity and remove enough partisanship and conceptual confusion that future philosophical discussions about agricultural values can proceed with greater depth and specificity.

My thesis proceeds in four chapters. The first is a detailed consideration of a well-developed defense of IA, crafted by economist Thomas R. DeGregori in his books Agriculture and Modern Technology: A Defense (2001) and Origins of the Organic Agriculture Debate (2004), as well as in many papers. Philosophically, DeGregori's arguments stand resolutely in an ethical framework developed by economists in the Institutional school of thought, one which shares fundamental normative features of classical and neoclassical economic perspectives, but which expands the theoretical tools with which to understand and intervene in markets. My second chapter is a critical analysis of the economic defense of IA. I outline 2 main problems. The first involves DeGregori's view of the relationship between technology and resources; the second involves his picture of agricultural science and technology as inherently progressive.

In my third chapter, I consider a well-developed alternative view of agricultural sustainability, which has been developed by Paul Thompson in his books The Spirit of the Soil: Agriculture and Environmental Ethics (1995) and The Agrarian Vision: Sustainability and Environmental Ethics (2010). Thompson thinks that more than the values that animate industrial agriculture are needed both to properly conceptualize the kind of thing agricultural sustainability is, and to work towards achieving some approximation of it. To this end, Thompson offers an interpretation of three ideals central to the agrarian tradition: 1) the free and self-sufficient yeoman family farmer; 2) the well-integrated, localized farming community; and 3) the virtuous citizen as a seeker of self-realization through discharging the duties and seizing the opportunities inherent in the particular station in life she is allotted.

Thompson's agrarian ideals, however, are problematic. In chapter 4, I express the most general problems through what I call 'the agrarian trilemma.' The final sections are then dedicated to outlining and attempting to mitigate persistent disagreements between Thompson's and DeGregori's views. I identify three areas in which their views may appear to be irreconcilably conflicting and attempt to find ways to go about minimizing, sidestepping, or dissolving them. I end by enumerating a set of overlapping ideals that I think can gain assent from both DeGregori and Thompson, and which can be the shared foundation for negotiating practical solutions to particular agricultural problems.

Chapter 1: The Case for Industrial Agriculture

“The professional’s job was once seen as solving an assortment of problems that appeared to be definable, understandable and consensual. He was hired to eliminate those conditions that predominant opinion judged undesirable. His record has been quite spectacular, of course; the contemporary city and contemporary urban society stands as clear evidence of professional prowess. The streets have been paved, and new roads connect all places; houses shelter virtually everyone; the dread diseases are virtually gone; clean water is piped into nearly every building; sanitary sewers carry wastes from them; schools and hospitals serve virtually every district; and so on. The accomplishments of the past century in these respects have been truly phenomenal, however short of some person’s aspirations they might have been” (Rittel and Webber 1973, 156).

1.1 ‘Industrial’ Agriculture as a Mode of Production

It is important to distinguish IA as a mode of production from IA as a philosophical outlook. A philosophy of agriculture, according to Paul Thompson, can be defined as “a somewhat coherent set of beliefs or principles that express the purpose or guiding vision of farming or animal husbandry” (Thompson 2010, 29). Agriculture as a mode of production, by contrast, refers to the characteristic practices, technologies, and institutional organizations employed by an agricultural system, irrespective of the philosophical rationale for their use. One reason that it is important to draw this distinction is that IA as a mode of production includes a very wide range of production practices ranging from low till and no till systems of soil conservation to draconian factory farming. And it is not clear that any single practice distinguishes IA from alternative agriculture (Darnhoffer et al., 2009, 71). Indeed, an industrially scaled farm might adopt organic practices in order to increase profitability without subscribing to the full organic philosophical outlook. Alternatively, an alternative agriculturalist might adopt certain industrial methods (e.g. scale-increases, increased mechanization, the reliance on external inputs) in an attempt to increase the influence and market share of their ecologically-minded farming practices. When we argue about the merit of IA, therefore, we must be clear about where our considerations apply. My task in this section is to briefly outline some of the characteristic features of IA as a mode of production before turning to its underlying philosophy. It is at the philosophical level, as I have suggested above, that one sees a sharper contrast between IA and alternatives.

Industrial agriculture as a mode of production often refers to large-scale operations that intensively exploit resources (land in particular) while minimizing labour inputs. This is achieved largely through the application of large mechanical infrastructure and modern

agricultural technology (such as improved germplasm, synthetic nitrogen fertilizer, synthetic pesticides, and the like), which are generally manufactured in highly mechanized production facilities located off the farm (Thompson 2010, 42-3). The social science literature measuring the socio-economic effects of IA on rural communities operates with a distinction between industrial and family farms based on properties grouped into two broad categories: scale and organizational attributes (e.g. Lobao and Stofferahn 2008). Scale can be measured spatially or in terms of annual gross sales, though gross sales metrics are increasingly preferred since modern technologies allow family-owned-and-operated farms to manage quite large tracts of land (ibid. 222). Organizationally, as industrial farms increase in scale, they generally take on institutional organizations common to large corporations (ibid. 221): they are “owned by one group of people, managed on a daily basis by another person or group, and worked by yet another group” (Browne et al., 1992: 30). Along with a shift from owner-operator organizations to incorporation, absentee-ownership, and paid-labour (often using low wage migrant workers) comes increasing vertical integration, such that producers, processors, distributors, and marketers are owned by the same firm (Lobao and Stofferahn 2008, 220).

In general, the ‘industrial’ denomination is quite loose at the level of production practices. Its meaning is made concrete only against a contrasting farming system. Of course, there are clear cases of corporate-owed, million acre farms that are worked almost exclusively from inside an air conditioned cab or computerized control house. But if our contrast class consists of family farming as practiced by American yeoman, even modern family farms, insofar as their farming practices require electricity, plumbing, the internal combustion engine, and the like are just scaled-down industrial operations.

1.2 ‘Industrial’ and ‘Alternative’ Philosophies of Agriculture

To outline the philosophical underpinnings of IA, it is helpful to contrast them against the belief system that is associated with organic, biodynamic, and ecological, or ‘alternative’ farming. Promoters of alternative agriculture tend to coalesce around several key philosophical themes. The first is a concern for the integrity of the ecological systems on which agriculture depends and with which it often is seen to interfere, particularly soil ecology (Altieri 2000; Lutikholt 2007; NSC 2011; Darnhoffer et al. 2009; Howard 1947; Douglass 1984). The main criticism of IA, here, is expressed in terms of “resource substitution”: when stewardship practices that protect and promote ecological processes like nutrient cycling, pest management,

and soil building are replaced by inputs of chemically synthesized nutrients and pesticides; or when human labour and land resources are replaced by mechanization and yield-increasing technologies such as genetic modification (Darnhoffer et al. 2009, 68). Proponents of alternative agricultural systems criticize IA for removing farming from the ecological cycles and processes on which it is supposed to ultimately depend, wedding it instead to an economic system of input production and technological progress, thereby threatening its ecological sustainability. The degree and extent of alternative agriculture activists' worries about ecological sustainability is closely connected to their views on ecological systems. Many environmentally-minded farmers conceptualize natural systems, even the biosphere as a whole, as existing within a delicate balance, the disruption of which spells catastrophe (Sagoff 2008, 199). Although some are less apocalyptic in their view of nature, all agree that reducing farming's impact on natural systems is a fundamental value for agriculture, partly out of consideration for future generations. And all agree on the importance of 'systems thinking' in order to design farms that ameliorate some of the woes of IA.⁵

The second philosophical theme of alternative agriculture is a criticism of IA's organization according to globalized "economies of scale," and a promotion of small-scale, family-based, localized food production systems (Altieri 2000). The quest for productivity-driven, scale-based increases in profitability, encouraged through agricultural regulations and subsidies in many countries, has led to the adoption of specialized, large-scale, mechanized, input-intensive, monocultural farms that are owned and operated by large firms (Darnhoffer et al. 2009). This can vitiate local food economies and drive small farmers out of business (Thompson 2010, 32-3). Although there are a variety of reasons why critics think this is a bad thing – e.g. that small farmers tend to be better stewards; that small-scale farm economies increase the demand for farm labour and thereby more effectively distribute wealth; that more people should farm because it is a worthy, edifying enterprise; that small farms support and sustain vibrant rural

⁵ Increasingly, ecological approaches to cropping systems, pest management, soil quality augmentation, and external input minimization have been gaining traction amongst conventional farmers. The main difference between more conventional applications of ecological insights is that they tend to maintain a relatively heavy reliance on intensive industrial methods and inputs, and use ecological techniques as an attempt to mitigate harm while maintaining high yields, low labour inputs, and scale-based profitability. For a good example of these kinds of approaches, see the FAO's <http://www.fao.org/agriculture/crops/thematic-sitemap/theme/spi/scpi-home/managing-ecosystems/integrated-plant-nutrient-management/ipnm-what/en>

communities; that small farms promote food security through investment in diversity – all agree that it is bad.

The third ethical concern surrounds human health. Proponents of alternative agriculture argue that IA's intensive management practices and use of fossil fuels, pesticides, fertilizers, and GMOs are causing human health problems either through contamination of the environmental commons (e.g. air and water) or through contamination of or deficiencies in our food products (e.g. pesticide residues and micro-nutrient deficiencies). Many of these health claims take the form of an invocation of the precautionary principle (DeGregori 2001, 83): if we did not used to eat it and it is not synthesized in nature, then, absent considerable evidence showing that it poses no risk, its best to avoid it. In its most reasonable form, this is a weariness (a) about how much we really know about human health, and therefore how well we are actually able to assess the risks of introducing new, manmade substances that the human organism has not been in contact with throughout its history, and (b) about whether the interests of the agricultural industry and government regulatory bodies are properly aligned with individuals' interests in their health.⁶ In the former case, think of the increasing advance of 'ecological' understandings of the human microbiome (Pepper and Rosenfeld, 2012) or the worries arising from Rachel Carson's work on bioaccumulation about the indirect impacts of DDT and other pesticides on human health (Carson 1962). In the latter case, think of the widespread mistrust of corporate agriculture and the FDA on the basis a) that corporations' primary interest and legal obligation is the production of profit and b) that government bodies like the USDA and FDA are subject to considerable political pressure from powerful agricultural lobby groups attempting to preserve their profitability even at the expense of public health.

The fourth general theme is a concern for animal welfare. One salient difference in the regulatory structures of organic and conventional agriculture is that organic regulations impose much stricter animal welfare regulations (NSC 2011, 11-23). These are aimed at allowing animals to exercise the movements and "normal patterns of behaviour" characteristic of the species as well as preventing injury and illness and ensuring humane handling, transporting, and slaughtering (NSC 2011, 17). Stress is placed on preventative measures to protect livestock from experiencing suffering either from disease or injury (NSC 2011, 11-23). And consideration of the

⁶ In its least reasonable forms, the weariness stems from vitalist assumptions that compounds synthesized by human beings lack a certain vital quality that compounds synthesized by living things do not.

quality of animals' lives is manifest in regulations that require access to shelter from inclement weather, sunlight, the outdoors, shade, clean air and water, and adequate nutrition (NSC 2011, 11-23).

The industrial philosophy of agriculture, as I will develop it in what follows, is a minimalistic political philosophy in two important ways. First, it is morally minimalistic, defending a public policy based on minimal notions of public welfare that are compatible with a wide variety of lifestyle choices and conceptions of the good life. Second, it is broadly aligned with the values that support a relatively deregulated market system for the allocation of agricultural goods and services. Taking Paul Thompson's lead, we can think of the industrial philosophy of agriculture as conceptualizing agriculture as just another sector of the industrial economy: the applicable social goals and obligations are no different for it than for any other industry, such as mining, manufacturing, or service industries. As such, the goals and normative constraints applicable to agriculture vary according to one's view of the proper normative structure of economic markets.

Having outlined in rough the practical and philosophical differences between IA and alternative agricultures, I now turn to two ethical arguments in defense of IA. The first argument centers on the empirical claim that IA is the *only* feasible strategy for alleviating world hunger. The second argument, extracted from the work of outspoken IA proponent Thomas DeGregori, maintains that IA is the most efficient means of alleviating world hunger. I will try to show that the former argument, to be ethically defensible, collapses into the latter.

1.3 The Argument from Production

IA is often defended as the only possible means of providing sufficient nutrition for everyone. This argument can be reconstructed as follows:

P(1): providing enough food to prevent everyone in the world from starving is the primary requirement that any global food system must satisfy in order to be morally endorsable (call this the sufficiency criterion).

P(2): Only IA production systems can satisfy the sufficiency criterion.

C: Therefore, IA is the only morally endorsable form of agricultural production.

Since P(1) seems like a reasonable normative assumption, let us set it aside for the time being and focus on P(2). A naïve defense of P(2) can be dismissed out of hand on the grounds

that we already produce enough food to feed the world⁷ (Foley 2011, 62; FOA 2009, 28) using a blend of alternative, smallholder, and industrial production systems. Estimates vary on the contributions of various farming systems. The ETC. Group (2009) estimate that 30% of global foodstuffs are produced through the industrial food chain, 50% through “peasant agriculture,” which is mostly smallholder and organic or low-input-by-necessity, 12.5% is hunted or gathered, and 7.5% is produced by “urban peasants” (1). Rigby and Caceres (2001) estimated that an average of 2.2% of all farmland in E.U. was under certified organic production, and that the organic sector was growing rapidly – in the U.S., the number of organic farmers was increasing by 12% per year at the time (22). The FAO (2002) reports that the total amount of land under organic cultivation in the U.S. and Europe tripled between 1995 and 2000, contributing to a total global footprint of 15.8 million hectares in 2001 (55).

Furthermore, Seufert et. al.’s (2012) meta-analysis showed that organic farming systems, defined as farms holding organic certifications or following these explicit standards, when compared on similar spatio-temporal scales to conventional systems, produced yields on average 25% lower (229). Comparing organic and conventional systems in which best practices were used, organic systems averaged yields only 13% lower. Now, given that we currently use 1.5 billion hectares of land for crop production, and that another 2.7 billion hectares has “crop production potential,” it is possible for us to nearly double the amount of land under production (Bruinsma 2009, 9). Even if some of this cropland is marginal and cannot produce yields as high as those from organic farms that use best practices on favourable soils, it seems likely that extensification – increasing the land used for food production – could easily make up for the yield gap. Hence, organic agriculture seems as if it could, in principle, feed the world. And it could likely do this in the future as well so long as there was concerted effort to reduce the use of feedstock for biofuel production and shift diets away from energy-intensive foods like meat.

A more nuanced defense of P(2) relies on demographic trends that project growth in the human population of between two and three billion by 2050 and the associated need to at least double food production (Foley 2012, 62). Some researchers claim that as much as a 70% increase is required (Bruinsma 2009). The challenge involved in vastly increasing food

⁷ Minimal thresholds of caloric intake that are meant to count as satisfactorily feeding the world vary. It is commonly accepted that between 1,720 and 1,960 kcals per day is minimally required to support “basal metabolism and light activity” (FAO 2002, 14). A more adequate minimum intake appears to be 2,500 kcal (Badgley and Perfecto 2007, 81).

production over the next 35 years, it might be argued, will require that we replace all current farming practices with production enhancing, intensive, green revolution⁸ technologies. This is particularly true, researchers argue, given the need to continue to reduce food prices in order to improve accessibility for the poorest to adequate nutrition and to reduce the spread of agricultural land into critical ecosystems like virgin rainforests. In what follows, I will put pressure on this claim by highlighting the way in which ethical assumptions about the acceptability of certain trends or the appropriate sites of intervention are tacitly embedded in the empirical projections that are used to define the conditions under which future agriculture will have to satisfy the sufficiency criterion. In particular, since projections (as well as our current circumstance) show that sufficient production capacity is not enough to ensure the alleviation of starvation, analysts' support of IA generally relies on IA's role in promoting economic growth. But going this route means abandoning the argument from production and defending IA on the basis of its economic efficiency.

Consider how we might test the claim that IA is the only way to satisfy the projected growth in demand for crops. First, we would need to operationalize the term 'industrial agriculture' in contrast to 'alternative agriculture.' It will suffice to think of IA, here, in terms of a number of the salient management strategies and technologies that drove the huge production increases of the Green Revolution(s). These are, for example, the use of large amounts of synthetic nitrogen, phosphorous, and potassium; synthetic pesticides; high-yielding hybrids of wheat, rice, and maize; large-scale irrigation technology, the increased use of large agricultural machinery; and high-density monocropping. Alternative agriculture, for present purposes, will simply be any system that does not adopt these yield-enhancing technologies.

We would then need to determine how many calories would be required to adequately supply our projected peak population of approximately 9.1 billion. Of course, human beings require more than just calories to survive. We need a wide range of vitamins, minerals, and micronutrients that are differentially available across a range of foodstuffs. Moreover, acceptable

⁸ 'The Green Revolution' is a term used to denote innovations in farm technology and management strategies that vastly increased agricultural production. Many commentators think that there were in fact two Green Revolutions, one in Mexico beginning in the 1950's and another in India beginning in the 1960's. The so-called father of the Green Revolutions, Norman Borlaug, was awarded the Nobel Peace Prize in 1970 and credited with saving over a billion people from starvation. The innovations central to the Green Revolutions included high-yielding varieties of rice, maize, and wheat. These were disseminated to farmers as a part of a package including existing technologies such as synthetic fertilizer and pesticides, large-scale irrigation technology, improved farm machinery, and global transportation infrastructure.

levels of food consumption for individuals are not constrained to the 1,720 to 1,960 kcals per day required to sustain basal metabolism and light activity (FAO 2002, 14). As a proxy for broader nutritional requirements and for the preference for more than the absolute minimal number of calories consistent with survival, most discussions of agriculture assume that certain consumption trends will continue into the future. As nations develop industrialized economies, economic agents will have more capital to spend on food. This translates into consumption of more food products and an increase in consumption of fruits, vegetables, meats, and dairy, as well as luxury items (such as coffee and chocolate) and highly processed items (Msangi and Rosegrant 2009, 4, see also FAO 2002).

These trends are supposed to culminate in the reduced income elasticity of food demand in industrialized nations: demand begins to level-off after populations reach an average energy consumption over 3,000 kcals per person per day (FAO 2002, 16). This is partly because wealthy populations cease to grow in number and average food consumption is limited by “the elasticity of the human stomach” (Alexandratos 2009, 8). To many, this means that supplying poor populations with enough affordable food is itself instrumental in slowing population growth.

Hence, supposing a population of 9.1 billion with a diet similar to that enjoyed by citizens of industrialized nations, we could calculate the kg per person per year allotments of cereals, fruits, vegetables, meats and dairy products, and luxury items that would be required to reach the point at which demand levels off in all non-industrialized countries. A stepwise breakdown of precisely this sort is not crucial, here. More important for supporters of IA is the trend of increasing yields in developing, smallholder, and peasant agricultural system through the adoption of green revolution technologies. This trend could produce average yields of 3.8 tons per hectare by 2050, which would translate into 3,099 available kcals per person per day at projected population levels (Hillbrand 2009, 17). And in more optimistic forecasts, where economic growth and the globalization of industrialized free markets are supposed to advance more quickly than they have between 1820 and 2005, agricultural innovation is projected to increase per hectare productivity by 0.9 percent per year and improved storing, processing, and transportation technology are meant to cut food waste “sharply” (Hillbrand 2009, 12). These trends would lead to an increase in average yields from 2.71 tons per hectare in 2005 to 4.07 in 2050, and an increase of 14.5% in average caloric availability from 2,800 kcals per person per day in 2005 to 3,207 kcals per person per day in 2050 (Hillbrand 2009, 12). The way in which

these yield increases are distributed across different crop and livestock products are assumed to be determined by the interaction between consumer preferences, production costs as reflected in food prices, and per capita incomes (Msangi and Rosegrant 2009, 7).

There are several available routes, based on this data showing the yield-increasing potential of further dispersal and development of IA technologies, to the conclusion that IA is a moral must. All routes begin with the evidence of the yield-boosting power of green revolution technologies. And each proceeds via a specification of the future market conditions under which agriculture must operate. For example, one might rely on projections that show a persistence of poverty-driven hunger in poor areas such as Sub-Saharan Africa, Southeast Asia, China, and Central and South America despite sufficient production capacity. Here, IA is meant to be an important component of economic growth that can provide these people the purchasing power to afford sufficient food. IA participates in economic growth by driving food prices down and keeping them low through increases in production and economic productivity. This frees up land, labour, and capital from the agricultural sector to be invested in other areas of the economy. On this version, IA is a central contributor to the economic growth of developing nations that will pull their citizens out of the poverty that restricts their access to food.

The need for increased productivity can also be strengthened by invoking projections about the share of agricultural feedstocks that will be taken up for biofuel production in the future. The boom in the biofuels industry is widely cited as the most important factor causing the world food price spikes of the late 2000's (ibid. 2009). This supports the position that, given the projection that government policy and incentives as well as rising petroleum prices will favour continued expansion of this industry's use of feedstocks and agricultural land (even where technology is developed to convert non-feedstock biomass into fuel), only considerable productivity increases in the production of cereals and oilseeds can keep food prices low enough to maintain access to minimal dietary requirements for the poorest (ibid. 2009). Other constraints, such as the reduction of global available farmland due to climate change, preservation initiatives, urbanization, and land degradation can also be added to bolster the need for productivity increases.

Notice, however, that as we take these future considerations into account, we move almost indiscernibly from talking about production to talking about productivity. This is because, as mentioned above, production is not the sole determinant of food accessibility; indeed, it is not

even the primary determinant; poverty is. Since increasingly globalized markets mediate poor people's access to food, eradicating malnutrition is supposed to be the job of worldwide economic growth. However, to the extent that we project current trends in consumption, income distribution, population growth, and per-use allocation of agricultural products, and restrict the availability of land for agricultural extensification, we make greater yield increases per input of labour, land, and capital appear necessary (See Bruinsma 2009).

Current forecasts yield the following conclusions: if current trends proceed as forecasted, we will need to increase production by 50-70% via a) increasing farm extensification into some or all of the remaining 24% of the world's land surface that is "to some degree suitable for crop production" (ibid. 2009, 9), and b) increasing yields per acre by between 1 and 1.43 percent per annum, both by narrowing yield gaps between industrial and non-industrial farm systems through the diffusion of green revolution technologies and by investing in new crop varieties and management strategies that can continue to increase outputs per unit of input.

But even best case scenario yield projections and economic growth forecasts leave between 409 and 427 million⁹ people malnourished in 2050, mostly in sub-Saharan Africa (Hillbrand 2009, 12). This despite the fact that cereal (mainly corn) use in biofuel production is projected to equal total cereal consumption in the developing world by 2020, thereafter holding or declining as second generation, non-foodcrop biofuels become economically and technologically viable (Fischer et. al. 2009, 12). And increasing meat consumption among wealthier nations is forecasted to require an additional 384 million tons per annum of maize alone by 2050, some 80% of the estimated total increase of 480 million tons per annum over 2005/07 levels (Bruinsma 2009, 4-6), contributing to an increase in cereal prices over 2008 highs of 30-50% (Msangi and Rosegrant 2009, 2).

The reason that we shift subtly from talking about production to talking about productivity, therefore, is partly to do with the fact that producing enough food at the level of aggregated farm output of various comestibles is not itself enough to eradicate hunger. Alterations are required to the whole food system, which itself is related, via economic markets, to the

⁹ These estimates vary widely according to the differing assumptions that enter into a model. Of particular importance are projected peak population numbers, differing rates of economic growth, different projected distributions of income, and alterations in the ration of GDP per capita to per capita consumption (See Hillbrand 2009 for a discussion of these variables). Hillbrand (2009) forecasts that the number of malnourished in developing nations could fall to as low as 370 million by 2050, so long as the pace of economic growth remains high (22). For our purposes, the specific numbers are not important.

production and consumption of a wide variety of other commodities. So IA looks like a necessary condition for minimizing poverty and starvation only to the extent that we accept prices as the ultimate mediator of access to food, and the operation of a relatively free market system as itself a morally acceptable means of food distribution. But this takes us well beyond the scope of P(2). The inference that IA is unique in its capacity to supply demand assumes that morally acceptable levels of production must keep pace with a number of morally questionable trends: pervasive and persistent inequality in income and food distribution, dietary composition, and the allocation of agricultural technology; large volumes – as much as 30% of total production – of food waste (Foley 2012, 65); high rates of population growth (especially in the poorest nations); huge diversions of cereals to the production of biofuels; among other things. It seems natural to many to suppose that industrialization (including the adoption of IA) is instrumental in ensuring that these trends do not result in starvation. But it is not immediately clear why we ought to prefer, on moral grounds, the operation of industrial capitalism to, say, massive targeted redistribution efforts, particularly where the former is not forecasted to solve the problems of poverty and hunger despite sufficient production capacity and global wealth.

Consider the following remarks on poverty forecasts:

The researcher posits a set of assumptions about the key drivers of growth, uses a model that relates these factors to economic outcomes, and produces projections that are presumed to be part of a range of plausible outcomes. The assumption of unchanging within-country distribution is also one that is often made in long-run forecasts ... mainly because there is little scientific basis for predicting long-range changes and the existing empirical work on the subject shows such divergent results... Consumption-to-GDP ratios could also change for endogenous economic reasons or because of political decisions, but are assumed in this paper to remain constant (Hillbrand 2009, 9-10).

Now suppose that, after constructing a model, based on a set of assumptions including the two important ones mentioned above (viz. that income distribution ratios will remain consistently unequal and that countries' allocation of GDP to domestic consumption will remain stable), we conclude that x% of global economic growth per annum is required to alleviate abject poverty and hunger. One may be tempted to interpret the normative upshot in the following general terms: "A breakdown of the world capitalist system..., or even a gradual turning away from the system that has done so much to reduce global poverty over the last two centuries would be disastrous," where one's more specific recommendation is to try to achieve the rates of growth that are projected to alleviate abject poverty (Hillbrand 2009, 20). The problem, here, is that all

the model says is that, assuming a certain set of conditions hold, abject poverty and the hunger that it causes will be ameliorated to x degree so long as $x\%$ growth holds. In order to use the model normatively (as a policy tool, for example), it is not enough that it is corroborated against historical data, new measurements, or other models. Rather, we need to determine what the appropriate sites of intervention are. But, as we have seen, P(2)'s invocation of the sufficiency criterion says nothing about the specific distributive conditions under which a morally endorsable agricultural system must operate, nor the important production inputs that it must minimize.

It is easy to fall into the trap of thinking that a good model with lots of variables that is well corroborated gives an accurate picture of the constraints that a morally acceptable agricultural system will have to operate under in the future. However, economic systems are not like physical or biological systems whose development depends on the properties of their component parts interacting through time in deterministic ways. Economic systems are made up of people and institutions that can change due to a wide variety of factors. Insofar as these factors centrally involve our moral deliberations and choices, the models need not unfold as projected if we decide that they ought not to and undertake intelligent interventions. The implication of this for the argument from production is that drastically increased production, enough to supply the demands projected by the models under scrutiny, becomes a moral constraint that favours IA only so long as we determine that the appropriate sites of intervention for alleviating hunger are primarily at the level of the producer. This means tacitly endorsing the various distributive trends that make it such that people starve under conditions in which enough food is produced to feed them. This, I think, is a manifestly indefensible position that no economist worth her salt would endorse. It is a classic example of a market failure.

The language of 'productivity,' however, shifts the focus from aggregate production to efficiency. Here, as we shall see in greater detail below, the assumption is that agricultural practices that convert costly inputs into valuable outputs at a higher rate are better because, everything else being equal, we all have access to more goods than we would with a less productive set of practices and we leave more valuable resources to be allocated to future production or other uses. IA is most productive because, effectively, it produces the cheapest food, where minimizing price is taken as a good proxy for minimizing the use of valuable resources such as land, labour, and capital. Hence, the argument from production, to be a morally

defensible position, requires this elaboration that relies on notions of efficiency. It is to a development of this argument, as extracted from the writing of Thomas DeGregori, that I now turn.

1.4 The Argument from Efficiency

DeGregori's case for IA can be understood in terms of the following argument:

Premise (1): Providing enough good quality food at a price affordable for the poorest and most vulnerable is a moral requirement for agriculture (viz. the sufficiency criterion) (DeGregori 2001, 184).

Premise (2): Industrialized agronomy has proven capable of developing technologies to solve projected food-shortage problems many times in the past, helping to bring "the population to six billion who are living longer, are better fed, and are in better health than ever before" (DeGregori 2004a, 127).

Premise (3): Industrialized agriculture is the most efficient means of food production available.

Premise (4): But, the cessation of industrialized agricultural practices would lead to a failure to provide access to sufficient food for a growing human population (DeGregori 2004b, 504) at the same time as it would require more land to be converted to agricultural production (DeGregori 2001, 157).

Conclusion: therefore, our primary moral responsibility in regard to agriculture is to disseminate and develop the knowledge and technologies of the industrialized system.

The argument is, as I interpret it, consequentialist in spirit. The logic of the argument is to justify the means, industrialized agronomy, due to its exceptional efficiency and technological advancement, as uniquely capable of securing (a) our most basic human caloric and nutritional needs, in such a way that (b) we can reduce valuable inputs such as labour, land, and capital. The argument, therefore, depends on two further implied premises in order to be valid:

(5) there exists no alternative to the industrial agricultural system that can both feed the world and achieve further goods or reduce harms; in part, because no other agricultural system involves such efficient technology and advanced knowledge; and

(6) if industrial agronomy is best positioned to feed the world while mitigating harms, then we are obliged to support its scientific and technological advance.

Indeed, I take these further premises to be the implicit thrust of premises (2)-(4). This is because the point of these premises, supported by DeGregori's careful explanation of scientific and technological advances in industrial agriculture, such as the invention of nitrogen synthesizing technology in concert with soil science, is to show how modern agronomy has been the decisive factor that has allowed our population to expand so dramatically while improving worldwide average calorie and vital nutrient intake, improving public health, and reducing the land under cultivation. It is to a more detailed exploration of this argument that I now turn.

1.5 P(1) and Economic Humanism

Let us begin by briefly considering how one might justify the sufficiency criterion. For DeGregori, the values of food sufficiency and availability derive directly from a concern for human welfare and basic human rights. This comes out in all of DeGregori's work as a concern over policies and practices that might prevent the "world's most vulnerable peoples" from having access to adequate nutrition and protection from harm by reasonable public health initiatives and regulations (DeGregori 2001, viii; but see also DeGregori 2004a, DeGregori 2004b, DeGregori 2004c, DeGregori 1998, and DeGregori 1978). DeGregori, in holding these values, is broadly aligned with the core elements of humanist (DeGregori 2004a, xi), modernist (DeGregori 2000, 201), democratic, and liberal perspectives.

DeGregori's liberal humanism can be understood, I think, as a perspective embodying ethical concerns that can be accounted for using utilitarian and deontological ethical frameworks. A good representation of these concerns appears in William F. Baxter's book *People or Penguins: The Case for Optimal Pollution* (1974). Here, he offers four fundamental principles that he sees as "ultimate testing criteria in attempting to frame solutions to problems of human organization" (Quoted in Williston 2012, 111). These are:

- (1) "every person should be free to do whatever [s/]he wishes in contexts where his[/her] actions do not interfere with the interests of other human beings...
- (2) Waste is a bad thing. The dominant feature of human existence is scarcity – our available resources, our aggregate labours, and our skill in employing both have always been, and will continue to be, inadequate to yield every [hu]man all the tangible and intangible satisfactions [s/]he would like to have. Hence, none of those resources, or labours, or skills, should be wasted – that is, employed so as to yield less than they might yield in human satisfactions.

- (3) Every human being should be regarded as an end rather than as a means to be used for the betterment of another. Each should be afforded dignity and regarded as having an absolute claim to an even-handed application of such rules as the community may adopt for its governance.
- (4) Both the incentive and the opportunity to improve his[/her] share of satisfactions should be preserved to every individual. Preservation of incentive is dictated by the ‘no-waste’ criterion and enjoins against the continuous, totally egalitarian redistribution of satisfactions, or wealth, but subject to that constraint, everyone should receive, by continuous redistribution if necessary, some minimal share of aggregate wealth so as to avoid a level of privation from which the opportunity to improve his/[her] situation becomes illusory” (ibid. 111-12).

It is this value orientation, I think, that leads DeGregori to affirm the importance of food sufficiency and accessibility for agriculture. Since we have seen that access to adequate food is not guaranteed by sufficient production, the way in which individuals’ right to adequate nutrition translates into obligations on producers is not yet clear. However, given that the labour, land, and capital, among other resources, that are allocated to agriculture are unavailable to create wealth via other economic endeavours, the injunction against waste above does seem to imply that minimizing these inputs per unit of food output is an obligation that sticks to agricultural producers. That IA is best positioned to do so is the point of the next premise in DeGregori’s argument.

1.6 P(2) and the Legacy of the Green Revolution

For DeGregori, agricultural history since the industrial revolution, and particularly with the green revolution, clearly displays industrial agriculture’s unique ability to deliver on the goal of food sufficiency and availability, thereby lending moral credence to this agricultural system (DeGregori 2001, 196). .

Development of agricultural science and technology, beginning with the industrial revolution and coming into its own with The Green Revolution, has an undeniably impressive statistical pedigree:

The increase in yields from the green revolution in rice alone has provided enough to feed one billion people. Growth in yields accounts for 92 percent of the increase in world cereal production since 1960 (Frisvold, Sullivan, and Ranases 1999). The world average

for grain yields per hectare rose from 1.1 tons in 1950 to 2.9 tons in 1992 (Conko and Smith 1999, in DeGregori 2001, 157).

This fueled the following developments:

Between 1961 and 1994, the number of daily food calories per capita rose from about 1,900 to 2,600 in developing countries, while their populations nearly doubled from 2.2 billion to more than 4.3 billion. Globally in the same period average daily per capita food supplies increased more than 20 percent. The increase in available calories per capital for developing countries rose 50 percent from 1948-1952 to 1994-1996 (Johnson 2000, 12). A century-long trend of falling real food prices continued during the period 1950-1992 as international food commodity prices dropped 78 percent in constant 1990 prices (Goklany 1999, 108; Goklany 2000, 161; in DeGregori 2001, 157-8).

These were major contributing factors to poverty amelioration such as took place in India, which saw a 20 percent decrease in absolute poverty rates, from 55 percent prior to 1970, to 35 percent in 1990 (IFPRI 1999; Wood 1998; in DeGregori 2001, 159).¹⁰ And these developments were also the driving force behind a reduction in the absolute number of malnourished people of 127 million that took place between 1969 and 1997, from 917 million to 790 million, *while global population doubled* (Goklany 2000, 161; UNFPA 1999, 3; FAO 1999; in DeGregori 2001, 159).

DeGregori sees the advance of industrial agricultural technology as a key contributor to the facts that “[d]uring the course of the twentieth century, average life expectancy in the world has more than doubled from thirty years to over sixty –six years” (McFalls 1998; in DeGregori 2001, 185) and that “for many developed countries ‘the chance of survival from ages 0 to age 60 is now greater than was the chance of survival from age 0 to 1 in 1900’” (Castles 1998; in DeGregori 2001, 184). In short, industrial agricultural science and technology has been a crucial piece of the modern struggle to secure the basic positive right of all humans to adequate nutrition, and to improve the quality of human life through access to safe, high quality, and varied foodstuffs. In this regard, thinks DeGregori, the statistics speak for themselves. Saving and lengthening human lives is an undeniable moral victory, and insofar as industrial agriculture

¹⁰ “The higher agricultural yields of the Green Revolution were pro-poor in that they ‘reduced absolute poverty in rural India, both by raising smallholder productivity and by increasing real agricultural wages.’ These benefits were not ‘confined to those near the poverty line - the poorest also benefited’ (Ravallion and Datt 1995). Because of the efficacy of agricultural technology, economic growth did not have to be sacrificed for there to be benefits for the poor as ‘there was no sign of tradeoffs between growth and pro-poor distribution’” (Datt and Ravallion 1996; in DeGregori 2004b, 506)

has been a key part of the modern efforts that have achieved this, it deserves our respect and moral allegiance.

1.7 P(3): Productivity and Allocative Efficiency

The main challenge in understanding and defending premise (3) is that the concept of ‘efficiency’ is normatively charged and highly contested. DeGregori’s celebration of the efficiency of IA practices, along with his defense of food sufficiency and accessibility as fundamental norms for agriculture, belies an implicit alignment with what Paul Thompson calls *productionism*. Productionism, according to Thompson, is the view that efficient “production of food and fiber is taken to be both a necessary and sufficient criteria for evaluating the ethics of agriculture” (Thompson 1995, 48).

In order to understand this claim, it is important to understand the distinction between *productive* efficiency (or *productivity*) and *allocative* efficiency.¹¹ Productivity is a measurement of “the rate at which costly inputs are converted to valuable outputs” (ibid. 105). Productive efficiency goes up only if a) output values remain stable while input values fall, or b) output values increase while inputs remain stable (ibid. 105). Thus, increases in production are not equivalent to increases in productivity, and *increases in productivity depend on what counts as a valuable input or output and how much each are valued relative to the others*. Primary input values represented in terms of money and labour will yield a different measure of productivity than input values represented in terms of land and environmental resources; likewise, output values represented in terms of saleable commodities will yield a measure different from values represented in terms of environmental quality.

Measuring the productivity of an agricultural system, therefore, requires that an analyst identify and value the inputs and outputs of a system in order to measure the rate at which a certain quantity of inputs yields a certain quantity of outputs. Changes in the system, such as the introduction of new technology, that increase the rate at which a given quantity of inputs yields output makes the system more productive. But any given production practice has many inputs

¹¹ In the agricultural economic literature, ‘economic efficiency’ is sometimes split into three parts: technical efficiency, which correlates to what I call ‘productivity;’ cost efficiency, which refers to a producers ability to minimize costs while maintaining or increasing production; and allocative efficiency, which measures producers’ responsiveness to price signals in light of their purchasing behaviour and choices to produce their own inputs vs. buy them. See Slade and Hailu (2014) or Fischer et. al. (2009) for more technical specifications. For our purposes, the distinction between cost and allocative efficiency is moot, since the normative root of both is to maximize economic profit through the manipulation of inputs and investments according to market signals.

and outputs, not all of which make it into a given productivity measure. The number of strokes of a pollinator's wings does not seem like an input that is worth measuring or minimizing. But what are the criteria of relevance at work, here?

For economists, the inputs important for productivity measures are generally those that are most scarce and in demand in a given economic context, which, at least for the world's largest producers, Canada, the U.S., and Australia, are usually labour, land, and capital (Thompson 1995, 107; Sagoff 2008, 94). However, the invocation of scarcity and demand points to a more general common measure of productivity: "the rate at which *costly* inputs are converted to *valuable* outputs" (my italics, Thompson 1995, 105); or in other words, the rate at which inputs with a certain economic value can be transformed into outputs of a greater economic value (Sagoff 2008, 96). Since the bee's wing beats don't command a price in any actual market, they are irrelevant to measures of productivity.

The principal commodifiable outputs of agriculture are food and fiber, and the costly inputs are labour, natural resources (such as land, manure, fossil fuels), and technology (such as synthetic fertilizers, pesticides, hybridized/ GM seed, and machinery). That these are the inputs and outputs of agriculture is determined by the fact that we exist within an economic system in which these items are scarce and in demand, and so they are valued and exchanged according to a common measure: dollars. To the extent that one of these items becomes scarcer or more sought after, and therefore more costly, a production practice will be more productive if it can minimize its use of this input. This is precisely how measurements of productivity in the developed world have come to focus on the minimization of labour in particular.

Commentators often take the normative content of productivity to be an injunction against waste (Thompson 1995, 108; Williston 2012, 111; DeGregori 2004a, 130). The commonsense rationale for increasing productivity is that valuable resources are conserved, perhaps in the interest of greater production capacity, or for the benefit of future generations, or to decrease the burden on nature. However, the term 'valuable resources,' here, and the reference to social goods, is telling. An injunction against waste is only significant once values are associated with particular inputs and outputs and some method by which to weight them against others is given. Without a reason to care about a particular input, it is unclear why one should ever be concerned to get more from less of it. Without a systematic way to determine the relative value of inputs and outputs, we have no way to navigate tradeoffs or measure the wastefulness of

multi-factor production processes. This means that while disinterested, quantity-based productivity measures are possible, productivity places a normative claim on us – viz., is an *injunction* against *waste* – only once inputs and outputs are given values that we recognize in common as legitimate and only once we have a systematic way in which compare these values. I think that productivity, as an economic concept that decisively favours IA, gets its normative force from the neoclassical concept of allocative efficiency.

Allocative efficiency is primarily used as a descriptive tool, referring to a social distribution of goods according to which all goods are put to their most valued use (Thompson 1995, 106). Neoclassical economics equates allocative efficiency with distributions in a free market based on 5 simplifying assumptions about economic agents: 1) that making rational choices is an optimizing procedure according to which an individual engages in risk vs. reward calculations; 2) that individuals can rank their preferences consistently and hierarchically, and that these preferences remain fixed; 3) that individuals have access to all relevant knowledge regarding available options and the likely outcomes of these actions within the context of specific choices; 4) that individuals act in economically rational ways, where an individual is economically rational just in case they act so as to satisfy their highest ranked preferences with the highest likelihood of success given the available options in a given situation; and 5) that willingness to pay (WTP), is an adequate proxy for preferences (ibid. 1995, 96-8).

Free markets are most efficient by definition because economic agents will only engage in transactions if it is in their best interest to do so. It is in their best interests to trade only where they have more goods than they need for the satisfaction of some preference(s) and less than they need for the satisfaction of others. Thus, the allocation of goods that will result from free trading best satisfies everyone's interests by definition. This allocation is called "Pareto optimal," which means that "it is not possible to rearrange production and consumption activity so as to make at least one person better off except by making one or more other individuals worse off" (Freeman 1998, 47).

Crucially, the preceding assumptions are not meant to furnish good predictions of how any individual will act, since they are radically simplifying, but rather predict patterns of choice that will emerge at the level of an economic system (Thompson 1995, 97; Sagoff 2008, 80-3). As such, the assumptions that frame the concept of allocative efficiency can be helpful to farmers in predicting the outcomes of policy changes, technological innovations, price fluctuations, or the

like, but say nothing in *defense* of choices to adopt IA modes of production. However, allocative efficiency also has a widespread normative connotation, evident in movements to deregulate markets the world over. This often implicit normative dimension is evident in DeGregori's work in two important ways. The first, most subtle way is in the assumption that that the invisible hand is an appropriate guide for farmers' decision-making. This assumption comes out in DeGregori's writing as an uncritical picture of agricultural practice as governed by market signals. The standard picture of a farmer's decision procedure looks like this:

Predominantly biological strategies of crop protection will be more labour-intensive and may require cash outlays to pay someone to monitor (called scouting) insect infestation. The farmer can choose a variety, that because of density of output, cropping pattern, or genetic characteristics, requires chemical defense to achieve full benefit. This will be an economic decision and will be done only if the cost of treating the crop with chemicals is less than the market value of the expected crop loss without pesticide use, and if the net output minus all input costs is greater than alternative varieties, cropping patterns, or crop protection (Oerke 1994, 39; in DeGregori 2001, 142).

This acceptance of the economic realities of modern agricultural production is echoed by industrial producers themselves: “[w]e are not driven by ideological concepts, political correctness or environmental persuasions; we are driven by the marketplace. Farmers always respond to incentives in the market and will produce sufficient food using combinations of conventional and organic methods to maximize their individual net returns” (Hendrix 2007, 85; in Badgley 2007). The implicit normative content, here, is that the maximizing procedure of economic decision-making is normal and acceptable as a guide for farmers' agricultural decisions.

The second, less subtle and more specific way in which allocative efficiency takes on a normative significance for agriculture is a) through arguments that the adoption of IA technology by farmers is proof that these technologies produce welfare gains, and are therefore right and good, and b) through arguments that underscore the value of increasing consumer choice by reducing food prices, both in terms of available options at the grocery store and in terms of allocating more resources to the satisfaction of other preferences. The former assumption, in DeGregori's work, looks something like this:

No matter how they phrase their critique of the green revolution, ... the critics can not [sic] avoid the implication that farmers are stupid. In the high-yielding varieties of rice alone, the farmers who have adopted the green revolution package and have been planting high yield varieties for decades number into the hundreds of millions... With

hundreds of millions of farmers in many different crops all over the world, what forms of coercion could have forced them into this form of agricultural activity and then forced them to continue in a practice so contrary to their interests? Are they simply stupid and need northern-white-male-dominated NGOs to show them the light and protect them from their own ignorance (DeGregori 2004a, 129)?

In other words, since individuals know their interests best, or are, at least, in the best position to decide what they are through trial and error, and since individuals have a legitimate interest in promoting their own welfare, their choices in the market place, so long as they are not coerced, reflect the best (because freely most valued) use of market goods.

It is important to keep in mind, however, that whereas advocates of IA often stand with both feet in neoclassical economics, DeGregori is no naïve supporter of the free market. Rather, DeGregori is a staunch supporter of the institutional school of economics; particularly the pragmatist branch, in the tradition of John Dewey, Thorstein Veblen, Clarence Ayers, and Walton H. Hamilton. Below I explore the elements of this intellectual tradition relevant to the argument at hand. For the moment, however, it is important to note that this school of economics opposes neoclassical economics insofar as neoclassicism a) divorces itself from sociological and anthropological inquiries into the evolution of the various social and political institutions in which economic markets are embedded,¹² b) makes overly simplistic assumptions about human motivation and behaviour, and c) associates progress with economic growth alone (Greenwood and Holt 2008; Hamilton 1919; Zimbauer, 2001). As an explanatory and predictive enterprise, institutional economics is interested in understanding and controlling economic activity much more comprehensively than with the more minimalistic, simplifying theories and models of neoclassical economics (Bush 1983, 35; Zimbauer 2001).

Despite these general differences between the two schools of thought, DeGregori's argument does not always depart widely from *normative* assumptions central to mainstream classical economics. In some cases he fails to challenge them while in others he implicitly or explicitly endorses them. The crucial normative difference in DeGregori's conception of allocative efficiency, as we shall see in more detail below, is that IA is not only most efficient when its efficiency is measured in terms of goods and services that have a price, but it is also most efficient in that it is best positioned to furnish productivity-increasing technology while

¹² These are, for example, "the conventions of competition, of contract, of property, of inheritance, of the distribution of opportunity which make incomes what they are" (Hamilton 1919, 314).

mitigating crucial environmental externalities that get left out of neoclassical productivity measures.

The key normative assumptions that are shared by neoclassical and institutional economists like DeGregori, which result in their support for something like allocative efficiency as a social goal for agriculture, and which lend normative force to economic productivity measures appear to be as follows: (a) that beyond basic human rights and freedoms, substantive differences in individuals' moral outlooks are either too thorny to yield practicable grounds for social policy or are acceptable differences under conditions of modern pluralism; (b) that an aggregation of individual preferences gives us a workable, objective measure of predominant social values; and (c) that market interventions beyond freeing public institutions from gross inequalities, and correcting critical market failures are excessively paternalistic since they may artificially alter individuals' ability to access valued goods and services.

Regarding (a), I take it as an alignment with the view that the appropriate way in which to provide the means for achieving individuals' conceptions of the good life is through policy measures that promote a properly functioning economic market, as well as public investment in the scientific and technological innovation in the interest of public welfare augmentation. This is a fundamentally political position, one which is broadly aligned with a utilitarian view of the good life, constrained by a deontological definition of the minimal limitations on human action. It can be characterized as broadly utilitarian because, within limits, the final criterion for the goodness or badness of an individual's life is the subjective happiness or satisfaction that she derives from it (Freeman 1998, 46). (a) is utilitarian in the same breath as it is pluralistic and democratic: the fundamental notion is that individuals are the final arbiters of what counts as a happy and satisfying life for them, and that, therefore, social policy should, within limits set by the conditions for meaningful opportunity of others, maximize the extent to which all are able to achieve their individual welfare.¹³

Substantive moral notions also stand behind (b) and (c). In support of (b) is the notion that markets are able to provide the social structures and goods required to live a happy, satisfying life; that is to say, on the one hand, that properly organized markets ought to direct the activity of all so as to satisfy the basic preferences of each, and on the other, that whatever goods

¹³ Since DeGregori is a pragmatist, I must be careful not to be interpreted as calling him a utilitarian or a deontologist. I attribute to him the fundamental political values outlined here only as claims regarding the minimal economic values subject to something like Rawls' 'overlapping consensus.'

or activities are not available within market structures either for purchase or as gainful employment can be achieved outside market structures using economic means. For example, a happy family life cannot be bought or sold, but may be facilitated by the material goods and services provided by markets. The idea, here, is that markets, when properly structured, allocate goods according to their most valued use. And under conditions of sufficient individual freedom, the allocations that result are voluntarily chosen based on individuals' informed, rational pursuit of their subjective welfare, whether this treats commodities as ends in themselves or means to non-market forms of satisfaction. Hence, existing allocations of goods or expressions of individuals' economic interests are good proxies for social goals since they indicate the economic conditions that allow individuals to achieve their conception of the good life.

(c) is a corollary of (b), which focuses on the value of a robust realm of individual autonomy. It says that more efficient allocations will always be better, as they allow individuals to augment their welfare. Politically, this means that governments are morally bound to increase market efficiency by correcting market failures, but also to refrain from intervening in free trades that are not undertaken due to power imbalances or coercion, lies or manipulation, a lack of relevant information, etc. Insofar as the industrialization of agricultural practices results from properly functioning markets, the resulting allocation of goods and production practices indicates a net welfare gain, whatever the specifics are according to individuals' conceptions of the good life. Regulations that, for example, artificially create scarcity of a particular good – say, industrial machinery – in order to promote some comprehensive view of the good life – e.g. yeoman farming – are forms of paternalism that i) infringe on individuals' legitimate spheres of freedom to define their own welfare, and ii) run the risk of unequally disadvantaging the least well off by driving the price of fundamental commodity prices up and thereby restricting their purchasing power (i.e. preference-satisfying power).

The result of these assumptions is that allocative efficiency appears as a substantive political goal, and public policy beyond the establishment of constitutional rights and regulatory structures to prevent market failure is seen as best responding to aggregated individual preferences. Now, if we see allocative efficiency as a substantive social goal, then the exchange value of market goods takes on a normative dimension that can provide productivity measures their normative content. Insofar as individual preferences and welfare can, to some extent, be read off of allocatively efficient (or approximately Pareto Optimal) distributions of goods, the

associated price distribution can be said to roughly reflect the welfare value of the commodities in question. Moreover, insofar as allocative efficiency is achieved within a political system that protects fundamental rights and freedoms and enacts regulations in the interest of maximizing aggregate welfare, we can be confident that individuals' economic choices are not the result of coercion, and therefore are legitimate proxies for their subjective welfare.

The upshot of all of this for DeGregori's argument is that industrial agriculture looks particularly productive only once we find a way to give normative significance to the inputs that it is set up to conserve. This, I have been arguing, is a normative defense of allocative efficiency. This evaluative standpoint is one that takes costly inputs and outputs as the fundamental goods for agriculture, and evaluates an agricultural practice according to its ability to satisfy demands for food in the least valuable-input-intensive way. Industrial agriculture's intensive use of land, and high chemical and mechanical inputs have made it such that 3 percent of the American population can produce more food – enough to feed a fourfold increase in population since 1900 – than 70 percent did a hundred years ago (Thompson 2010, 95), and on less land than was cultivated in 1930 (Degregori 2004a, 127). From the vantage point of market goods, industrial agriculture's efficiency is staggering. Moreover, if the primary guiding norm of agriculture is food sufficiency and accessibility, as per P(1), then industrial agriculture's ability to minimize valuable inputs while satisfying its overarching political aim looks like a very strong argument in its favour.

1.8 P(4), P(5), and P(6), Industrialism, Technological Progressivism, and Scientism

Recall that the claims made in this part of the argument can be broken into two components: i) the claim that the industrial agricultural system, supported by modern agronomy, is the only viable candidate that can solve environmental problems while satisfying the sufficiency criterion; and ii) the consequentialist affirmation that so long as this is true, we are obliged, as a matter of public policy, to support the advance of industrial agriculture production practices, and the agronomic and biotechnological research that fuels its progress.

Several important interpretive problems arise at this point. The first is that DeGregori's conception of IA is tied inextricably to a particular view of science and technology. This is a pragmatist, progressivist picture in which technological advance and moral advance are inextricably linked. The second issue is a logical one: the intended strength of the consequentialist endorsement of IA is unclear: are we to abandon all other forms of agricultural

practice besides IA? Are we to abandon research that does not advance a particularly industrialized agricultural system? If we accept IA's superior ability to achieve our desired ends, then what kind of political commitment does this entail, and how ought we to deal with extant farming practices that are not industrial in nature? I turn to the first issue in the following section and deal with the modality problem in the conclusion.

1.8.1 Technological Progress and its Humane and Benevolent Science

DeGregori's defense of the industrial philosophy of agriculture is motivated in large part by an association of the industrial system with science and technology and a view of science and technology as self-correcting and progressive. The association of science and technology with IA is, so far as I can tell, a matter of historical genealogy: IA grew out of scientific and technological advances of the industrial revolution (DeGregori 2001, 33), in particular the invention of the Haber-Bosch process for synthesizing ammonia used for nitrogen fertilizer (DeGregori 2004a, 49) and agricultural machinery, and, more recently, techniques for genetic modification, mechanical irrigation, and improved pesticides (DeGregori 2001, 157; DeGregori 2004a, 97-104). These were the technological means devised through the advance of scientific knowledge in response to production and productivity problems in agriculture.

The concepts of science, technology, and progress hang together in a pragmatic picture of the human epistemological and moral enterprise, for DeGregori. Both knowledge and values, according to DeGregori, advance and are proved through their ability to solve the practical problems of the human animal in her environment. The advance of technology is a kind of creative, open-ended problem-solving process in which theory and practice interpenetrate (DeGregori 1987, 1243-4). In short, "the production of physical artifacts (technology in the common sense) and mental artifacts (theories, ideas, concepts) are," for pragmatists like DeGregori, "two instances of the same basic process of creative problem solving" (Samuelson 2008, 3). And problem solving, for pragmatists, is the basic engine of improvements to the human condition (Horner 1989, 579).

For DeGregori, technologies are means of intelligent interaction with the world, defined as "complex[s] of resource creating ideas, skills, and behaviour that have created instruments... used by humans to further the life process" (DeGregori 2004c, 1061). The 'tools' that are central to a technological interface with the world go beyond the material instantiation of ideas or practical solutions to material problems, and include artifacts that aid the process of thinking and

understanding. Indeed for DeGregori, “advances in technology have produced new knowledge in science as often as the reverse has been the case” (DeGregori 2001, 31). They have done so not only in the obvious sense that we have used them to discover new knowledge, but also in the sense that they embody key technological know-how, which is often non-verbal and which leads to inventions that provide new metaphors and models that can lead to theoretical advance (DeGregori 2001, 31-2). For example, the microscope, by showing us cellular structures and interactions, provided us the models using which to understand the origins and development of life (DeGregori 2001, 16). What this means, for DeGregori, is that knowledge creation and technological innovation are two sides of the same coin.

DeGregori’s conception of technology is also closely tied to a notion of resources. This view, which comes from Erich Zimmerman, is summed up in the pithy line ‘resources are not, they become’ (DeGregori 1987). ‘Resources,’ for DeGregori, are not fixed quantities of material substance, like oil reserves or mineral deposits, that can have their quantities measured independently of our ability to extract and use them. The notion of a resource, on this view, is internally related to the technology invented for its extraction and use (or visa versa): “the very use of a tool presupposes both resources to make them and resources to be exploited by them” (DeGregori 1987, 1245). What counts as a resource and how much of it we have depends on our technological capabilities to use a given substance for our own benefit, and the amount of the substance required, given our technological means, to produce a unit of benefit.

Science and technology can create or augment our supply of resources in four ways. First, science and technology can provide us tools that allow us to use substances that were previously useless. Fire, for example, allowed us to access nutrients in a variety of plants that were previously indigestible. Likewise, agricultural tools and knowledge created the resource that is arable land by giving us the knowledge and skills to produce food from it (DeGregori 1986, 466). Indeed, “[t]he history of human migration and settlement is a history of people creating arable land by devising new means and new technologies to produce food” (DeGregori 1987, 1255). Second, science and technology can allow us to access more of a substance through augmented extraction techniques. For example, “[a]dvances in geology, such as plate tectonics, and in geography give us new understanding of how various ores are formed, sorted, and where they are likely to be found” (DeGregori 1987, 1255). Third, science and technology can increase our productivity, reducing the amount of a given resource required to produce a beneficial

output. Green revolution agricultural technologies, for example, have increased the yields that can be produced on a given plot of land, thereby reducing the need for agricultural land and, in effect, increasing the quantity of it available (DeGregori 1987, 1252). Fourth, advances in technology can allow us to substitute a scarce resource for one that is abundant, thereby sustaining our ability to produce a given good despite the exhaustion of a given resource once necessary for the production process (DeGregori 1987, 1253). The invention of the Haber-Bosch process, for example, allowed us to substitute guano, a crucial source of nitrogen that supported the population explosion around the turn of the century, with atmospheric urea (DeGregori 2004a, 49).

Given the internal connection between technology and resources, DeGregori seeks to show that modern agricultural history since the industrial revolution has been characterized by increasingly rapid technological advancement, and correlatively, the decreasing scarcity of existing resources as well as the increasing availability of new ones. Given this trend, DeGregori proposes that it is reasonable to expect that, so long as we continue to promote scientific and technological advance, we will thereby continue to extend the reach of current renewables and non-renewables, and find replacements for those that we exhaust. Insofar as population is projected to continue to grow, and insofar as raising the standards of living of more and more people will require that we increase the availability and variety of foodstuffs, it seems reasonable to suppose, moreover, that we will need to continue to expand the carrying capacity of the earth by finding new resources and extending old ones. Thus, IA's intensive industrial technology is supposed to be the clear choice.

DeGregori's pragmatist conception of technology defines technological progress relative to the problems that face individuals and communities in their day-to-day lives. Since it is in individuals' interests to solve their daily problems through the creation of technological solutions, DeGregori sees the process of scientific and technological advance as best left unbridled, free from the stultifying ideology that resources are fixed and finite, and that 'sustainability' requires that we live within their limits: "I do not know of any idea more calculated to keep people impoverished than the idea that resources are natural, fixed, and finite" (DeGregori 2004a, xviii). The evolution of our science and technology is part and parcel with the human project of creatively and intelligently bettering our collective lot.

Conceptualizing IA technology in this way implies that the problems created by IA do not give us cause to go back to preindustrial technologies or restrict the flow of new science and technology. This is because, according to DeGregori, science and technology are self-correcting (DeGregori 2001, 181): “the lifeblood” of problem-solving in the scientific and technological tradition is “difference, contention, and opposition” (DeGregori 2004c, 1065). For pragmatists, this means not only that the effectiveness of a given technological solution is open to question and new solutions a welcome form of competition, but also that the nature of the problem, and how a technological solution ought best to address it, is part and parcel with technological advance. That solutions to problems always gives rise to new problems is the same as saying that what we see as problematic and how we see it as such changes alongside our technological advance (Mayhew 2010, 216); or in other words, “[t]echnology understood as problem solving carries its own concept of appropriateness” (DeGregori 1978a, 474).¹⁴

Because DeGregori conceives of scientific problem-solving as a souped-up version of everyday attempts to find practical ways to make life better, he sees science and technology as important purveyors of moral progress. It has this capacity in three important ways. First, the advance of science and technology, insofar as it leads to improved quality of life, can change our norms surrounding the standard of living that is minimally acceptable (DeGregori 2004a, 20). Advances in agricultural technology, for example, have made it reasonable to view adequate nutrition as a basic human right. Second, science and technology, through the same productive capacity that raises standards of living, can free individuals and societies from the bondage of dependency on others to supply the basic conditions of a good life, and beyond that, it can furnish the physical freedom and material means for the pursuit of excellence (DeGregori 1978, 470; DeGregori 2004c, 1065). This might occur through the alleviation of national neocolonial economic bondage, in which economic dependency compromises a society’s political power (DeGregori 1978, 470), or of individual poverty, where choices regarding how to live one’s life are severely restricted by the need to attend to providing basic material requirements (DeGregori

¹⁴ Such a sentiment is implicitly echoed in the interpretations of many analysts of the legacy of the Green Revolution. For example, Gollin et al. (2005) say:

While the challenges facing intensive systems are large, it is striking that the natural evolution of these systems has already alleviated many of the popular fears and skepticism voiced concerning the original Green Revolution. The lesson that emerges—and it is essentially a hopeful one—is that as long as adequate funding is available to support innovation, new institutions and technologies are likely to evolve in response to emerging problems and challenges (1316).

2004c, 1065). Third, science and technology can be used “to undermine the pseudoscientific mythology that supports unjust and discriminatory practices” (DeGregori 2004a, 25). When an unjust ideology, for example white supremacy, is based on a false picture of race and racial difference, science and technology’s ability to uncover the truth is a powerful means for diffusing the racist’s beliefs and affirming humans’ equal moral worth.

DeGregori, like Clarence Ayres, takes the centrality of problem-solving to science and technology as providing the groundwork for judgments of moral progress or backwardness within cultural institutions and across cultures (Mayhew 2010, 221). The normative changes in science and technology, for both authors, are models of the process of moral progress that can be used to alter the structure of other institutions, assess cultural norms and practices, and evaluate moral ideologies. I turn now to a brief look at how this normative component of DeGregori’s view is supposed to work.

1.8.2 The Ceremonial/ Instrumental Normative Distinction

DeGregori is an institutional economist in the tradition of John Dewey, Thorstein Veblen, Clarence Ayers, and Walton H. Hamilton. The important normative features of this faction of institutional economics are that it draws a normative distinction between ceremonial and instrumental forces within social institutions, and that it aligns itself with instrumentalism.

Central to this approach to economics is the concept of an institution, defined in the following terms by renowned institutional economist Douglass North:

Institutions are the humanly devised constraints that structure political, economic and social interaction. They consist of both informal constraints (sanctions, taboos, customs, traditions, and codes of conduct), and formal rules (constitutions, laws, property rights). Throughout history, institutions have been devised by human beings to create order and reduce uncertainty in exchange. Together with the standard constraints of economics they define the choice set and therefore determine transaction and production costs and hence the profitability and feasibility of engaging in economic activity. They evolve incrementally, connecting the past with the present and the future; history in consequence is largely a story of institutional evolution in which the historical performance of economies can only be understood as a part of a sequential story (North 1991, 97).

Institutional economists look at the way formal and informal norms embodied by a variety of social institutions have ‘evolved’ to solve problems associated with expanding spheres of trade, increasing specialization and division of labour, and increased economic productivity.

Institutionalists are interested in understanding why some economies stagnated or declined while

others grew, and generally, what kinds of institutional forces promote sustained increases in productivity and economic growth.

Research and development organizations, for institutionalists like DeGregori, are conceptualized, via pragmatism, as model institutions whose incremental process of creative problem-solving is the purveyor of institutional (normative) and material progress. However, “institutions are often a negative force preventing the adaptation to new ways of doing things... In addition to retarding innovation (ancient China), institutions can also skew the distribution of economic rewards toward a powerful group (Bourbon France), repress scientific inquiry (Galileo) or emphasize materialism as the source of happiness (present day America)” (Greenwood and Holt 2008, 447).

DeGregori and his ken diagnose this problem as stemming from a justificatory procedure typified by “acceptance of precedent as authority” (Mayhew 2010, 214), or as “the patterns of organization and behavior derived from the past” (ibid. 216). In DeGregori’s words, instrumentalism “views technology as the dynamic force for economic change, while traditional social beliefs and practices are considered the forces that resist change” (DeGregori 1978a, 472). This dichotomy is generally maintained, as I have indicated above, in terms of the criteria for an acceptable justification. For example:

Ceremonial values are warranted by those mores and folkways that incorporate status hierarchies and invidious distinctions as to the relative "worth" of various individuals or classes in the community. They rationalize power relationships and patterns of authority embedded in the status quo. Instrumental values are warranted through the systematic application of knowledge to the problem-solving process. They emerge from the processes of inquiry into causal relationships. As criteria for correlating behavior, they ensure causal continuity in the problem-solving process. Whereas ceremonially warranted values rationalize habitual modes of thought and behavior embedded in traditional practices, and thereby tend to be "past-binding," instrumentally warranted values are inherent in the processes of scientific inquiry and technological innovation, and thereby function as standards by which behavior can be correlated in the dynamics of institutional change (Bush 1983, 37).

Instrumental forms of norm justification, as we have seen, are pragmatic in the sense that a norm’s yielding useful knowledge or skill is the criterion for its rightness or wrongness.

Ceremonial justification relies on the cultural entrenchment, or status quo status, of norms of thought and action as its criterion for success.

The most offensive ceremonial norms, DeGregori thinks, are those which are employed to justify a status quo that benefits the powerful to the detriment of the powerless (DeGregori 1978a, 468). Opposition to green revolution technology, on the basis of 'traditional' religious or cultural beliefs, a romantic picture of 'natural' nature, or the precautionary principle, by wealthy westerners is the problem for which the ceremonial/ instrumental dichotomy provides the explanation and the antidote. For DeGregori, those who would limit the advance of industrial technology, such as "[t]he advocates of small-scale technology" or limits-to-growth theorists, "fundamentally lack a knowledge of the historic patterns of technological change" (DeGregori 1978a, 471). This leads them to abuse the precautionary principle, invoking "the myth of the riskless alternative" by assuming that the tried and true status quo is safe and without harm or opportunity cost (DeGregori 2004a, 151). Once we see that technological change is progressive and that misuse and abuse occurs at the hands of conservative institutions, we will focus our worries and criticisms less on restricting the spread and advancement of technology and more on the institutions that would control it and use it for untoward purposes.

This approach is exemplified by DeGregori's view that industrial agricultural technology is not to blame for the continued maldistribution of food (DeGregori 1987, 1252). Industrial agricultural technology has solved the problem of world hunger, DeGregori thinks, and shows every promise of continuing to furnish the resources necessary to feed us. The problem is that the economic and political institutions that control the distribution of wealth are not yet set up "to provide to everyone the capacity to earn sufficient income to obtain what is generally available" (DeGregori 1987, 1252). The problem of distribution is a problem of institutional ceremonialism, for DeGregori, one that can be separated cleanly from technological solutions to productivity problems.

This means that promoters of appropriate technology or limits to growth, who champion technologies that are small-scale, decentralized, labour intensive, energy efficient, environmentally benign, and locally controlled (Hazeltine and Bull, 1999), are fundamentally misguided in their attempts to achieve the goals of food sufficiency and availability. Restricting IA technology in accordance with an ideological view of appropriateness recreates the very problem that unbridled technology is positioned to solve: the problem of institutions preventing the benefits of technology being accessed by all. Hence, the problem is one of institutional, not technological, reform. To restrict the process of innovation to include only technologies of a

certain scale, labour intensiveness, or the like, is to undercut the very process that has managed to bring “the population to six billion who are living longer, are better fed, and are in better health than ever before” (DeGregori 2004, 127). “The policy implied here,” according to one commentator, first and foremost “is a more equitable distribution of income,” not an imposition in the process of scientific and technological advance that DeGregori sees as central to IA (Horner 1989, 583).

1.9 Minor Conclusion

DeGregori’s institutionalist economic argument in support of IA, as I have been developing it, involves three major segments. The first is an alignment with liberal, democratic economic values, as exemplified by Baxter. These values stand behind the endorsement of food sufficiency and availability as the primary norms for agriculture as per premise 1, but also the defense of industrial agricultural efficiency. Although institutionalist economists do not uncritically accept the notion of Pareto optimality or allocative efficiency as normative grounds for deregulation – since they reject some of the simplifying assumptions of mainstream economics – the view of IA’s superlative productivity as speaking loudly in its favour derives from a normative defense of markets as, minimally, correctly identifying many of the politically salient goods of agriculture.

However, institutionalists have added a layer to mainstream economic conceptions of IA’s efficiency: efficiency is not simply a function of conserving scarce resources using available technological and organizational means. Rather, resource stocks can be augmented and substituted such that arriving at a conception of a practice’s efficiency requires that we take into account scientific and technological trends that may decrease the practice’s reliance on the resource in a variety of ways.

The second major element of the DeGregori’s economic defense of IA is a pragmatist conception of the relationship between science, technology, and moral progress. The industrial revolution, as manifested in IA, was a response to practical and social problems such as poverty, food scarcity, and resource exhaustion. It has, like any good problem solving process, managed to go a long way towards solving these problems. It has done so through the application of scientific methods for the production of knowledge and technology aimed at bettering the lot of humankind. This is the message of premise 2. Hence, insofar as IA can be associated closely with a pragmatist picture of science and technology, and insofar as its legacy is a significant

improvement in the quality and quantity of human life, IA seems well positioned to respond to modern environmental and social problems as they arise. Thus, premise 3's claim about IA's efficiency is given another elaboration: it is most efficient not only in the sense that it is most economically productive, but also in the sense that it is institutionally arranged to address practical problems as they arise. And premise 4 becomes the natural corollary that any divergence from this approach to agriculture would sacrifice either its ability to meet the sufficiency criterion or its ability to do so most efficiently in any of the 3 senses outlined.

The third major element of the view under analysis is the institutionalist distinction between ceremonial and instrumental modes of warrant. DeGregori uses the pragmatist description of how knowledge and values advance through the problem-solving process to endorse instrumental modes of warrant. Associating IA with modern agronomy allows him to use this normative distinction to endorse IA over other, less science-based approaches to agriculture.

With this, we arrive at an attempt to formulate the conclusion. The interpretive difficulty here is that it is not clear that all alternative agricultural philosophies necessarily fall prey to problematic institutional conservatism and precaution or that all modern industrial practices will survive efforts to solve modern problems. Take, for example, the principles of agroecology, a science-based approach to farming using localized, renewable resources and ecological systems-thinking to design cropping systems that improve fertility and minimize pollution.¹⁵ Such an approach is committed to the same minimal political and economic values that stand behind DeGregori's defense of AI. However, it seeks to incorporate a more comprehensive set of social goals into its philosophical outlook. And insofar as there is some suggestion that adoption of alternative agricultural practices, to some degree or other, is consistent with achieving the food sufficiency and availability goal,¹⁶ it is not clear that DeGregori rules such systems out as worthy

¹⁵ For a quite comprehensive list of such principles, see http://agroecology.org/Principles_List.html.

¹⁶ There is controversy surrounding whether organic farming, universally adopted, could feed the world (Badgley and Perfecto, 2007; Spiertz 2008, 50). There is also controversy about whether universal adoption of organic agriculture would pose a net threat to the environment through more extensive land use (Spiertz 2008, 50). However, these debates are in their infancy, and do not yet begin to have data regarding the way in which diverse global patterns of agricultural land-use might achieve food sufficiency and availability and maximize environmental quality. For example, focusing less chemical and tillage-intensive systems around key sites of biodiversity, water filtration, soil fertility, or the like, may be a key to supplementing intensive production systems while protecting important ecological functions. Moreover, some modern work on agroecological farming systems suggests that research and development in this area shows clear promise of being able to increase the economic productivity of

of individual or public pursuit. Indeed, many ‘mainstream’ agronomists are increasingly reformulating the problems for agriculture in terms that incorporate a much more comprehensive set of social goods into their conceptions of agricultural productivity. The following picture of the modern agricultural predicament is typical of a growing body of agronomic literature:

Today, global agriculture feeds a population of approximately 6.4 billion *and delivers a wide range of additional services such as rural employment, bioenergy and biodiversity...* However, the main question is not if we can feed 9 billion people in 2050, *but can we do it sustainably, equitably and on time in the face of the growing demand for biofuel and the probable changes in climate?* Agriculture has to meet at a global level a rising demand for bio-based commodities such as food, feed, fiber and fuel, *while satisfying even tighter constraints with respect to the safety of products, the environment, nature and the landscape* (my emphases, Spiertz 2008, 43; see also Hurni et al 2008, 67).

Such an approach would involve living within some limits set by the conditions for the ecological integrity of processes that renew soil fertility, filter water, sequester carbon, and promote biodiversity. DeGregori’s strong faith in technological change makes him averse to accepting the need for setting limits on growth or conceiving of sustainability in terms of a fixed resource base. On the face of it, then, it appears as if policies that incentivize the maintenance of certain thresholds of renewable resource stocks and the ecological conditions for their renewal fail to properly account for the role of technological progress in altering the kinds and quantities of resources available.

There is, however, no obvious conflict between technological progress and the maintenance of resource-sustaining ecological systems. Indeed, as DeGregori rightly points out, we have often replaced an environmentally harmful reliance on renewable resources with a more benign reliance on non-renewables. Many diverse and functional ecosystems have been saved from exploitation due to the increased intensity of agricultural production through the application of fossil fuels (in the form of a variety of technologies such as nitrogen fertilizers and machine work). Another example is the substitution of hydrocarbon energy sources for wood fuel, saving huge tracts of forest. Moreover, technological development shows promise of enabling productivity gains in the use of renewables, thereby augmenting our ability to derive significant benefits from renewable resources while maintaining the stocks required for future generations and ecological processes. Genetic modification and other forms of plant breeding are prime

farms while advancing social and environmental goals external to neoclassical productivity measures (See, for example, DeLonge et. al. (2016); Kremen and Miles (2012); and Lundgren and Fausti (2015)).

examples of such technology, but so are diversified and rotated cropping systems, agroforestry, biological pest management, and the development of biofuels. What this means, it seems, is that there is no obvious conflict between setting limits on the use of resources and the ability of technology to advance. So long as better technology is a crucial means for allaying modern problems of pollution and over-exploitation, investing in the creation and dissemination of this technology appears as a critical role for government policy-makers. What this means is that the extent to which DeGregori can oppose concepts of technological appropriateness is a matter of degrees not of kind.

Hence, DeGregori's argument cannot be interpreted as ruling out sensible market mechanisms for the incorporation of externalities or regulations for the protection of human rights or the environmental commons. Instead, I think it is best read as a minimal, political vision for agriculture that sets out guidelines that any agricultural system must fit within in order to be an appropriate object of public approval and funding (in the form of research grants, subsidy money, etc.). The conclusion is, thus, more aptly formulated as follows: insofar as any agricultural production system contributes to the satisfaction of the sufficiency criterion and advances the development of technologies for the creation, extension, and substitution of resources, it ought to be the object of public support; otherwise it should not be endorsed. A minimally sustainable agriculture, on this view, is one that is focused first and foremost on producing sufficient food for the world's population through the application of science and technology to productivity problems.

Chapter 2: Analysis

Notice, here, that environmental as well as social values, on DeGregori's view, though we might find ways to incorporate them into our food system, remain external to the agricultural *production* process, applied as *political constraints* on a process that is primarily aimed at maximizing commodious outputs based on costly inputs. We may choose, as a political collective, to structure costs in such a way that makes the adoption of technologies that have environmental benefits profitable, or we may institute regulations that forbid or limit certain kinds of production activities (e.g. that violate human rights or have suboptimal welfare effects), but the proper production ethic is one of profit maximization.

In what follows, I present three challenges to DeGregori's defense of IA. The first is a challenge to the monolithic, and somewhat simplistic conception of resources that is critical for DeGregori's optimism. I argue that while the four ways in which technology affects resources offered by DeGregori – creating, extending, finding/ extracting, and substituting – work well for non-renewables such as minerals, they fail to account for crucial subtleties in the interaction between technology and renewable resources, especially those that are most fundamental to agriculture: clean, fresh water and fertile soil. This will lead me to a discussion of the univocal optimism that DeGregori extracts from the history of the Green Revolution. I argue that this optimism, while not entirely misplaced, relies on a picture of technological progress as self-correcting and cumulative that paints over crucial intricacies regarding the cultural, social, and political conditions required to keep innovation in line with environmental and food accessibility problems in a timely manner, and in particular, fails to distinguish political divergences between economic and scientific forces directing industrial agriculture production as well as research and development. Here, I argue that DeGregori's ethical framework does not provide grounds for applying a productionist ethic to agricultural production contexts and a more comprehensive ethical framework to policy-makers and regulators. Last, I point to important tensions between DeGregori's alignment with a pragmatist account of moral progress and his normative use of the dichotomy between ceremonial and instrumental modes of warrant to support IA. I argue that pragmatist insights do not support this distinction in a way that can be used to normatively assess different philosophies of agriculture.

2.1 The Problematic Grounds of Economic Optimism

Institutional economists like DeGregori have achieved considerable mainstream uptake of their optimism in the potential of technological innovation. It is widely believed that, through its various effects on resources and its productivity-increasing potential, technology stands to solve environmental problems as they come to pose significant threats to our welfare, while at once sustaining welfare-increasing economic growth. Economists believe that it will do so by way of demand from economic agents interacting in a properly structured marketplace.

While a degree of such optimism seems warranted, three points require emphasis. The first is that innovations that display promise of surmounting important modern agricultural problems are ones that tend to conserve and augment resources and protect fundamental biogeological system services like fertile soil, a stable climate, and clean water (Hurni et al 2008), resources whose fundamentality is not reflected in their market price. There are certain natural systems for which there is no obvious substitution and whose functional integrity is a fundamental limiting factor on production. These include biogeological systems such as nutrient cycles, soil biomass cycles, hydrological cycles, climate-stabilizing carbon cycles, and the like, as well as ecological processes that promote biodiversity and stability. While we have found ingenious ways to augment the productivity of these cycles through management strategies, plant breeding, and non-renewable and renewable resource inputs (*ibid.*), agricultural production is ultimately limited by our ability to sustain these systems and make efficient use of the resources that they produce. The complexity, interrelatedness, and scale of these systems make it such that it is fanciful to suppose that we have anywhere near the knowledge, skills, or political resolve to be able to replace these systems or repair them after a collapse.

Second, even if we could conceivably replace, for example, the supply of water from underground aquifers and freshwater lakes and rivers, as they become polluted or exhausted, with desalination technology or large-scale water filtration plants, the cost of doing so, in terms of resource use and opportunities forgone, seems to warrant concerted effort to adjust production and consumption habits in order to maintain the independent, self-sustaining systems that exist. This is particularly pressing when we consider the cost of failure in cases where we misjudge our ongoing ability to maintain the flow of once renewable resources: desertification, famine, pestilence, etc. Hence, our ability to grow our population and our consumption of agricultural goods must always be measured relative to the means available for protecting fundamental

renewable resource systems. Here, appropriate precaution means curbing consumption and pollution until renewable resource-sustaining technologies exist and are sufficiently diffuse to allow for increased consumption and wealth accumulation to occur without threatening the functional integrity of fundamental natural systems.

So far, an economist like Degregori may acknowledge these points and still hold that disseminating and investing in technology is the answer to the problems that they present for agricultural production. The trouble is that there is a tension between DeGregori's endorsement of IA as most economically efficient and his close association of IA with the problem-solving ability of science and technology. There are two issues, here. One is that, descriptively speaking, it is not clear that the same kinds of ethical considerations guide economic agents and scientists. The other is that it is not at all clear that maximizing individuals' subjective welfare and autonomy *ought* to be the decisive principles in guiding scientific research.

To see this, consider the way in which 'the invisible hand' drives innovation: on the supply side, scarcity of a valued production input drives prices of the output up and creates the opportunity for productivity-increasing technologies, or production methods that rely on more abundant or accessible inputs to gain market share and capture higher economic rents. On the demand side, high or increasing demand for a given output creates opportunities to gain market share through increases in production capacity, better marketing (branding/ distribution), and increased productivity-enabled competitive pricing. However, as economists have long realized, innovation driven by these forces often results in the production of negative externalities: public welfare costs of economic activity (generally conceived in terms of reductions of human welfare that are born by those who are not beneficiaries of the activity). What this means is that, insofar as our innovations are driven largely by economic forces, they will not be very well positioned to address environmental problems before they cause considerable welfare losses among those who are best positioned to exert economic influence, and they will not be in a position to address environmental externalities that cause welfare losses to those with little economic influence (*viz.* the poor).¹⁷

Moreover, two further features of markets that often prevent economic agents from acknowledging or working towards solving problems that are evident from less profit-oriented,

¹⁷ According to environmental lawyer and historian Dan Tarlock, this was an important justification for political intervention in markets for the protection of the environment in the history of environmentalism (Tarlock 1994).

self-interested perspectives. The first is that infrastructural and manufacturing investments tend to breed a kind of conservatism.¹⁸ Take, for example, the automotive or oil and gas industries.¹⁹ These industries have invested huge amounts of capital in infrastructure, technology, and knowledge, allowing them to become massively profitable and politically powerful. Despite the significant welfare impact, current and projected, of the negative environmental externalities caused by carbon dioxide emissions and other forms of hydrocarbon pollution, the profitability of extant infrastructure disincentivizes investment in developing green energy and transportation technologies. So long as a service is in demand, and so long as an industry has invested heavily in the infrastructural and technological capabilities to meet this demand in a particular way (i.e. using a particular resource or production method), it will be in this industry's interest to continue its production practices so long as its production capacity and profitability make it such that (a) significant short and medium-term profitability losses would result from the investment in new infrastructures, and (b) no startup company can compete in terms of price and scale with the product flowing from existing infrastructures and technologies. This is a conservatism that results from industry governed by the profit motive and market forces of supply and demand. But it can spill over into political systems as well. Where there are not considerable support structures for the unemployed, including forward-looking retooling and entrepreneurial capacity-building, citizens' foremost political value is often attracting and keeping employers. This means that there is a very strong political force protecting industry status-quo, especially where markets are globalized and companies can leverage governments by threatening to relocate.

The second, related feature of market structures operating primarily through profit-maximizing competition that makes them prone to conservatism comes from consumer culture. Markets operate via firms catering to subjective wants and, if possible, creating new ones. This

¹⁸ One way to understand this conservatism is in terms of 'path dependence.' I use 'conservatism' for lack of a better word. However, there is an important difference between this kind of conservatism and the 'ceremonialism' decried by institutionalists. The difference is that sticking to a particular infrastructural investment is justified in that it prevents short to medium term profitability problems. The issue is that these problems get prioritized over what are more serious long-term problems relative to interests outside of the firm in question.

¹⁹ One might object that the automotive and oil and gas industries are unique, that their experience doesn't generalize to agriculture. The response, on the one hand, is that insofar as we are conceiving of all these industries as subject to the same kinds of market forces, it's not clear why this problem should not generalize. On the other hand, it seems pretty clear that evidence of conservatism can be found in the impacts of market conditions favouring technological scale, specialization, and input substitution. These forces tend to favour insensitivity to externalities such as nutrient pollution and carbon emissions and make it such that start-ups that internalize these costs cannot gain a foothold.

means that for-profit firms are well positioned to direct people's consumption patterns primarily by increasing consumption or allocating it across brands that vary in price and perceived quality. Under such circumstances, moral questions about what one ought to conceive as welfare enhancing, how one should allocate one's money between personal and collective benefits, and which demands firms ought to capitalize on are entirely external to the market system: the nebulous stuff of cultural change. Take, for example, the way in which the environmental movement has entered our economic lives: energy star appliances, products made from recycled materials, and new marketing buzz words have all taken a culturally generated conception of a public good – environmental quality – and used it to increase the perceived quality of consumable products. In such a case, we have not had to ask hard questions about our levels of consumption, our allocation of wealth to personal pleasure as opposed to social action, which kinds of products and services constitute true benefits to ourselves and society, or the like. Rather, our newfound environmental conscience is fit neatly into our existing lifestyles by being allayed in the same way our other preferences are: via the consumption of the same kinds of goods and services that we are used to.

The general problem is that aggregate individual preferences for ecological services is not a good indicator of global environmental health and does not necessarily align with those environmental problems that pose the greatest risk to crucial biogeological systems. This is particularly true where populations are poor and undereducated, since such populations will tend to be focused on more immediate concerns than local (never mind global) environmental quality, and will not be in a strong position to exert influence over markets to protect the environment.²⁰

Three cases in point are currently playing out, the first with what many climate scientists see as a developing climate crisis, the second with global shortages of clean, fresh water, and the third with global biodiversity loss. However, the pattern of increasing production to a critical ecological tipping point, followed by dramatic suffering and decline has been a common plight of civilizations throughout human history (Fraser and Rimas 2010). It seems natural to suppose that the most general reason for this is that satisfying the welfare interests of human beings often requires disruptions in natural processes. And even where the integrity of natural processes is in

²⁰ There are, of course, important exceptions, particularly among peoples who maintain a strong cultural connection to the land, such as many of Canada's First Nations. These cultures often resist destructive incursions on their land despite considerable poverty and in the face of the possibility of considerable economic gain. However despite their strong motivations, their lack of economic influence often means that they are bowled over by interest groups backed by the resources to commandeer courts or lobby politicians.

the interest of humans, as it is in agriculture, the human welfare gains from exploitative activities that damage these processes may continue beyond a point at which degradation is significant and without rapid or simple remedy.²¹ This can occur, among other reasons, because a) there is a significant time delay between the offending activity and the downstream welfare losses, perhaps due to the cyclical nature of the system; b) the degradation impacts subsystems that have only marginally negative effects on our welfare, but that are interrelated in a broader system in which these marginal changes create feedback mechanisms; or c) the welfare impacts of an activity are unequally shared such that benefits accrue to those who control the activity and harms to those who do not. These systemic effects can foil individual economic actors for a number of reasons: because we cannot directly and immediately see the consequences of our actions on these broader systems; because we do not know enough about the systems and how they will be impacted by a given practice to be able to foresee threats to our welfare; because the welfare losses are remote in time (Kyriakou 2002); or because environmental and social goods are not among our welfare interests. Hence, insofar as consumers are not highly educated about biogeological systems, acculturated to care about temporally distant states of affairs and future generations, and inculcated with interests that include at least those environmental processes on which human welfare depends, their interests will not be good proxies for the environmental processes worth protecting.

(a) is exemplified by the bioaccumulation of DDT or other toxic compounds in ecosystems, which can cause varying degrees of perturbation and functional disruption. Another example is the dust bowl wind erosion of the 1930's, where yearly degradation of the prairie grassland ecosystem, especially its soil tilth and soil-holding grasses, eventually caused vulnerability to climatic fluctuations such as the devastating wind erosion that occurred under drought conditions. (b) is exemplified by air pollution resulting from localized agricultural activity that contributes to climate change and, eventually, negative impacts such as desertification and erratic climatic events in the more immediate environment. (c) is exemplified by water pollution caused by excessive or improper nutrient applications, which produce benefits for farmers in the form of simplified application, time saved, and improved crop yields, but negatively impact populations who use the water resource. Another good example is the heavy

²¹ For a more technical economic discussion of how non-linearity, stochasticity, and the existence of 'basins of attraction' in natural systems causes problems relative to the assumptions involved in various attempts to specify an economic model of sustainable development, see Kyriakou (2002).

use of broad-spectrum pesticides, which unselectively decimates insect populations including predators of important pests as well as pollinators, causing pest and/ or pollination problems for farmers who do not rely on the heavy application of broad-spectrum pesticides and who cultivate species that require predators and pollinators.

The point can be summed up in the following way: many sensible regulations and market mechanisms must be imposed on markets before self-interested individuals will experience welfare losses due to environmental problems. Now, such a conclusion seems abhorrent to most economists due to their assumption that individuals' preferences are a good proxy for their welfare and autonomy. For if autonomous choices drive consumption activity, then market impositions appear totalitarian. I offer an alternative reading of the project of economics in my final section that is intended to circumvent this problem. Suffice it to say, here, that insofar as it is not a central feature of economic institutions to encourage moral deliberation and accountability for the aggregate impacts of individual choices, it is not clear that consumers can be conceived as acting autonomously in a morally or politically robust sense. Indeed, to the extent that many marketing strategies actively encourage individuals to be compulsive, self-satisfying, and to express and identify themselves through products and brands, it seems reasonable to suppose that engaging in economic exchanges often erodes individuals' focus on collective goals and obligations, as well as philosophical questions about the true nature of human happiness, freedom, or flourishing.

2.2 Scientism, Sustainability, and Passing the Normative Buck

One way to internalize the environmental costs of production in economic productivity measures is to regulate or put a price on negative externalities based on measures of the fragility, substitutability, and fundamentality for production of the impacted ecological processes. These would be importantly science-based approaches, and so one might presume that DeGregori's support of a science and technology-based industrial agriculture program stands resolutely in support of them. However, in order to even begin to determine how fragile or resilient an ecosystem is, whether and how we might substitute it with an engineered solution, or how reliant our production practices are on it, we need to define the ecosystems in question and determine indicators for their 'sustainability' or 'health' or 'integrity' or 'resilience.' The problems involved with defining ecosystems and measuring their 'sustainability' or 'ecological integrity' have important normative features that challenge the simple dichotomy between ceremonial and

instrumental modes of warrant that DeGregori sees as explaining the successes of the Green Revolution and promising bounty and environmental quality in the future. The normative failure of this dichotomy, combined with the failure of profit-driven markets to be a satisfactory driver of agricultural innovation, tempers the grounds for DeGregori's faith in a science-based, industrial market system's ability to adequately cope with environmental problems as they arise.

2.2.1 Pass the Problem, Please.

What exactly does 'sustainability' mean? And how are we to determine whether or not we have achieved it? Although I will take a closer look at conceptual issues surrounding sustainability in chapter 3, there is one important point to keep in mind, here. This is that determining whether a system is sustainable requires that we draw borders around the processes and elements that we are including in the system, and define performance criteria according to which the system can be said to have persisted, be healthy, possess resilience, or the like. Doing these things requires that we make defensible normative choices regarding what systems it is interesting and useful to analyze and what elements and processes in these systems we want to maintain. DeGregori's institutional vision of agricultural sustainability prioritizes production and productivity problems based on concerns for the rights and welfare of the poorest. He has considerable confidence, based on the statistical pedigree of the green revolution, that research and development institutions can solve these problems through technological progress if they are left free of invidious ceremonial modes of justification. The terms 'invidious' and 'progress,' however, belie a normative circularity that, I think, arises from an improper handling of the pragmatist account of values. In particular, there is a confusion regarding the descriptive and prescriptive messages of pragmatic ethics. To see this, and how it relates to our sustainability question, let us look a little closer.

We might ask an institutional economist, at this point, what makes ceremonial patterns of warrant 'invidious.' The answer, as best I can make it out, is that justifying actions or policies on the basis of tradition or authority is problematic when it serves the interests of those who make the justification and disadvantages those who must abide by the rules set out. Take, for example, someone who criticizes a practice as being unsustainable on the basis that it does not conform to the traditional way of doing things in a given culture. Insofar as the tradition is the sole warranting rationale and insofar as the tradition benefits the member making the justification but disadvantages the individual pursuing the practice, there are obvious grounds to criticize this

justification. However, these grounds are not simply that the justification cites tradition, since traditions can be an important part of what makes life worth living. They are that the justification reifies inequality and injustice. And it is not clear to me that inequality or injustice are problematic for instrumental reasons; or that they are not themselves normative traditions that we use to discern and interpret problems. The issue, here, is that we cannot distinguish between the descriptive picture of how a norm arose relative to a particular problem, and the normative claim that this norm is warranted, or right and good. In effect, the ceremonial/ instrumental distinction appears to take for granted that some problems are worth solving and others not without rationalizing the norms used to make this distinction.

Let's look at an example: consider a case in which a government justifies human rights abuses on the basis that they are necessary for the economic prosperity and security of the nation; in other words, by claiming that certain collective rights – the economic conditions for universal prosperity and national security, for example – trump others, such as the right to vote, freedom of speech and association, religion, and the like.²² The justification of such claims may be that particular individual rights and freedoms find the means for their realization in the success of the collective body: that the ballot is no use to a society without bread.

In such a case, the institutional criticism doesn't seem to cut much ice. The justification for certain rights violations is precisely that they are necessary components of a political system that is able to deliver on the fundamental conditions of human life; it is, in other words, an instrumental justification regarding the practical conditions for the solution to crucially important problems in human life. Insofar as such measures have been part of an approach that has reduced poverty and provided better standards of living for all, one might think that these abuses are instrumentally justified.

The problem, instead, we are inclined to say, is that insofar as these basic human rights have not been upheld, justifications invoking increases in living standards or the provision of certain fundamental rights are prevarications; the measures of success are wrongly set. One can justify trying to uphold all universal human rights and failing for pragmatic reasons, but not purposefully violating some as a means to achieving others. Such a compromise, in effect, displays a lack of proper respect and concern for human beings, callousness in regards to the

²² This is in fact the kind of argument offered to western diplomats by Chinese diplomats in response to criticisms regarding the government's human rights record. See http://news.xinhuanet.com/english/2005-12/12/content_3908887.htm for an example of such an argument.

welfare and dignity of the individual on the basis of an abstract idea of the collective. Under such conditions, there can be no meaningful commitment to human rights at all, since the fundamental grounds of human dignity – moral and political autonomy – are sacrificed to an abstract entity whose ‘prosperity’ and ‘security’ bear no necessary relation to the rational process of collectively determining the proper principles that will govern all.

I think that this serves as a strong analogy for the problems with the vision of sustainability that we get from DeGregori. He claims that the evidence is clear: technology, when unbridled by insidious conservative interests, has shown and continues to show great power in overcoming carrying capacity constraints and solving environmental problems. The justificatory logic of science and technology, which warrants theoretical and evaluative frameworks based on their ability to successfully solve salient practical problems, is best positioned to guide agricultural policy and practice. The problem, here, is that the moral argument in favour of science and technology is based on a descriptive picture of its advance that takes validity of the ‘salient practical problems’ for granted. This move shares the justificatory problems of endorsing the violation of certain human rights based on the ability of a government who does so to secure others or improve basic welfare: it takes an institution’s proven ability as the means required to achieve ends that we agree are valuable as evidence that it has the resources to determine ends and the appropriate way to value them.

2.2.2 But Science Shall Deliver Us

The question for DeGregori’s faith in science and technology are ‘what salient agricultural ethical problems are science and technology best able to address?’ DeGregori’s answer to this question, as we have seen, is ‘productivity problems,’ both in the sense of providing the means for achieving production levels adequate for feeding the world affordably and in accordance with consumer preferences, as well as addressing resource shortages and environmental externalities as they pose threats to human health and wellbeing.

The normative difficulty for DeGregori’s argument is that the productivity goals of IA are tied closely to modern economic markets, incorporating only those goods that have economic value. DeGregori’s institutionalist insight into sustainability concerns properties of the scientific and farming communities: how quickly is our technology advancing, how promising are our prospects for overcoming resource scarcities, and how eager to adopt new technologies are our

farmers?²³ Now, this is undoubtedly an important and powerful insight. And it has an important and powerful political implication that must not be downplayed, here: that continuing to grow economies and improve standards of living requires the ongoing investment (perhaps in the form of incentives, grants, subsidies, or the investment in public research initiatives and institutions) in science and technology that promises to augment and create resources and mitigate environmental degradation.

The important point, here, is that the dichotomy between ceremonial and instrumental forms of warrant that is supposed to justify scientific and technological approaches to modern agricultural problems is not a good guide with which to determine in advance the kinds of social and environmental problems that make legitimate and important claims on agricultural institutions. The question as to whether the norm of profit maximization, for example, is warranted in reference to its ability to solve practical problems or in reference to its pride of theoretical place in the authoritative tradition of Adam Smith says nothing about the legitimacy of the practical problems in question and fails to recognize that placing authority in a particular tradition or figurehead is often central to interpretations of what makes a situation problematic. We need to be able to make finer distinctions here: between cases in which a norm is problematic because it unequally advantages some by disadvantaging others; because following it creates problems for the realization of other values; because it fails to provide adequate guidance in some particular case; because generalizing its scope to place an obligation on all of us creates problems for our ability to continue following it; or because what seems like a problem is just a misrepresentation of the facts. Such problems are internal to the practice of science and navigating them well is not reducible to generating evidence and producing technologies.²⁴

²³ Institutional economists have attempted to model this formally in terms of the ratio of ceremonially warranted patterns of behaviour to instrumentally warranted ones within social institutions (Bush 1983).

²⁴ Jasanoff (2000) has written a lovely little article that argues that the differences in the views regarding the safety and acceptability of GMOs is often not reducible to competing versions of the facts. The facts, such as they are, seem straightforwardly to support GMO safety. The root of the conflict, as Jasanoff diagnoses it, is differing views on the way in which divergent publics and their values have been incorporated (more accurately, left out of) the process of determining what counts as a harm, how to value predicted benefits, what acceptable levels of risk are and how they are to be measured, who will be responsible for unforeseen consequences and what their responsibility will consist in, and the like. For Jasanoff, dissenters' lack of confidence in GMOs is often not a result of a failure to appreciate the facts, but of skepticism over the concepts and methodologies used to measure GMO safety and public utility; and in particular, that these processes, by masquerading as value neutral measures of risk, fail to adequately acknowledge the sources and effects of market-oriented values and to incorporate values

In light of this, there are several important challenges to DeGregori's framing of the sustainability problem that he does not possess the normative resources to rule out. One such claim is that the normative grounds for timely responsiveness to environmental problems and appropriate innovation are much more comprehensive than a concern for human beings' right to eat well and remain free from suffering imposed by acute environmental degradation. Examples of this kind of challenge can be found in the place-based environmental ethics of Mark Sagoff and Paul Thompson. According to these views, appropriate responsiveness and innovation is best achieved by individuals who have a strong personal, cultural, and material relationship with a particular ecological locale. And often the kind of innovation that is most appropriate is not primarily technological, but cultural: uncovering new ways to respect the land and balance this respect with competing elements of the good life. Here, the challenge is to the scope of the normative resources required to achieve genuinely sustainable agriculture.

A second, complementary kind of challenge is that agriculture's moral and political value is not appropriately captured by measures of its economic efficiency. There are several ways to cash this out. One is to claim that understanding the systemic conditions for agricultural sustainability requires us to incorporate the dynamics of social, economic, and ecological systems into a much broader model. In the words of a local advocate for agricultural sustainability: "[f]ood is connected to every major problem we face as a society – rising medical costs, poverty and hunger, declining farm incomes, the paving-over of farmland, wildlife protection, urban sprawl, youth unemployment, and communities at risk. These problems will only be solved when we connect the dots" (ROI 2008, 4). Viewing agriculture in this way makes it impossible to mount an ethical argument for one set of practices based solely on their productive capacity and productivity. Proper analyses of agricultural production systems, on this view, cannot be cut off from the way in which these production systems are integrated into broader social, economic, and ecological systems, and therefore tied up with problems in these various contexts.

Another version of this general claim, one that is fundamental to agrarianism, relies on arguments purporting to show that agriculture has a special social or political role to play beyond the production of food and fiber commodities. An ethical analysis of an agricultural production

fundamental to public conceptions of health, safety, environmental quality, and sustainability. This alone could, I suspect, serve as a case study illustrating the normative inadequacy of DeGregori's approach

system, on this view, would have to include metrics regarding how well the system played this special role.

These reconceptualizations of the kinds of problems relevant to an ethical analysis of agriculture do not contradict the notion that food sufficiency is a fundamental goal for agriculture. Rather, they challenge the industrial vision of agriculture by reconceiving the scope, kinds of central causal units, and functional thresholds of the system that we want to be sustainable. The point, here, is that an instrumental, problem-oriented approach like DeGregori's cannot rule out the legitimacy of these reconceptualizations. Industrially scaled production facilities and the use of machines and modern biological and information technologies have proven successful in achieving and sustaining food sufficiency over an exponential growth in demand. The implementation of these technologies and production practices has, however, created a number of 'salient practical problems' that many suggest require innovation in social and political value systems that govern institutions relevant to agriculture. The root of the perception of these problems lies in broadly encompassing systems perspectives of society's relationship to the natural world that embody a concern for human and environmental systems beyond the ongoing provision of resources and material satisfactions. It is to one such perspective that I now turn.

Chapter 3: Paul Thompson's Agrarian Visions

*"The first task of economic inquiry is to abandon the imprisoning idea of greed of economic man and to formulate a conception of man that is both accurate and worthy of human endeavor"*²⁵

Paul Thompson has analyzed with great lucidity and insight the genealogy of the industrial philosophy of agriculture, explaining how it has come to delineate the problems relevant to agriculture in terms of production and productivity. His positive work is dedicated to reformulating the way in which we define the political role of agriculture in society by reintroducing ethical concepts and frameworks that he sees as having been ignored by economic perspectives. In this chapter, I focus on his attempt to develop a number of key agrarian claims that give agriculture a special political importance.

To see where Thompson picks up the debate about IA, consider the historical evolution of the "farm problem" in western agricultural economics (Sumner et al. 2010, 405). Early on, in the 20's, 30's and 40's, the problem was that "agriculture suffered from low returns on human and other capital, low incomes for farm families, and undue variability (and especially downside shocks) on investment returns and incomes" (ibid. 405); or in other words, "severe poverty and hardship combined with lack of opportunities within agriculture" (ibid. 406). An assortment of policy approaches, guided by economic models and projections, have gone a long way towards solving this problem for farmers in western economies, partly by reallocating the majority of its labour force into a growing nonfarm employment sector, partly through vast increases in productivity per unit of labour input, and partly through a variety of insurance and subsidy programs that stabilize and augment commodity food prices (ibid. 405-6).

But this approach has given rise to new problems. Chief among them: (1) smoothing out price volatility and achieving food security within globalized markets; (2) predicting and modeling the economic effects of publicly funded scientific and technological research; and (3) dealing with massive food surpluses and environmental market failures (ibid.). The economic approach to solving these problems focuses on ways to a) improve individuals' economic welfare, generally through promoting economic growth; and b) increase the system's allocative efficiency, through price adjustments, improved access to information, and/ or decreased regulation.

²⁵ (DeGregori 1978, 17).

Thompson is in the business of expanding the normative perspective that goes into delineating the farm problem and formulating solutions. He is interested in the daily habitual and practical activities that are required to keep people sensitized to ethical issues such as inequality and environmental health. He takes as his point of departure 3 ideals central to the agrarian tradition. The first is the Jeffersonian view of farming as an important site not just of resource creation for the polity, but of the formation of good moral character and thereby of the proper grooming of a landed democratic citizenry. The second ideal paints a picture of large-scale, centralized, bureaucratic institutions as inferior to small, decentralized political units due to their inferiority at tailoring themselves to localized conditions and reacting quickly and appropriately to local problems, especially where these involve ideosyncracies. The third ideal centers on Wendell Berry's articulation of the way in which agrarian communal and practical forms of life offer unique potentials for a kind of place-based self-realization that is meant to be more meaningful and satisfying than the urban alternative.

Thompson extracts from these ideals philosophical threads that he thinks are critical for formulating and addressing modern agricultural problems in a way that can realize agriculture's special social and political potential: as a model of sustainability. Insofar as sustainability is something that we want, Thompson thinks that we neglect a careful consideration of agriculture's political potential at our peril.

I focus on five central themes, each of which is meant to make political positions on agriculture that invoke deontological or utilitarian principles seem like less comprehensive moral guides to modern agricultural problems. Thompson attempts to tie together threads from communitarianism, virtue ethics, phenomenology, pragmatism, and ecological systems analysis with an agrarian focus on the habits and practices of rural people. His goal is to show how agrarian ideals can be a helpful route to revitalizing philosophical considerations that he sees as critical for addressing issues of sustainability. In what follows, I examine the central features of Thompson's reframing of 'the farm problem.'

These are:

- 1) A replacement of the Cartesian, dualistic subject, with an *embodied* account of the epistemic and moral subject.

- 2) An account of *intrinsic value* that identifies communal linguistic *and* material practices as a source of fundamental values; intrinsic values are those language and practice-embedded norms that are essential to shared senses of purpose and identity.
- 3) An account of *habits* as the systemic, social grounds for a kind of virtue-conducive moral ecology. A well-organized agricultural system, for Thompson, is politically potent in its ability to exemplify the institutional conditions conducive to the emergence of the agrarian virtues of stewardship and self-reliance.
- 4) An account of sustainability that integrates the virtue-conducive institutional ecology and the integrity of the natural systems in which it is embedded and upon which it depends; I call this *integrative sustainability*.
- 5) An argument for the power of *agrarian ideals* in reframing our approach to the environment and working towards integrative sustainability, through their fostering of the agrarian virtues.

Together, these five elements form the scaffolding for Thompson's endorsement of agrarianism, which is meant to illuminate agriculture's special role in creating and reproducing a socio-ecological system that can make our lives and communities better and, in particular, advance our quest for sustainability.

3.1 Embodied Embeddedness

Thompson's discussion of embodiment does not take up a significant portion of his writing on agricultural themes, though it forms a critical part of his argument. I interpret him not as taking a hard position on the nature of human subjectivity; rather, I read him as pointing to certain affinities between the Cartesian philosophical tradition that maintains a clean separation between subject and object, mind and world, and an unsatisfying tendency for modern economic conceptions of agency to restrict descriptions of moral life to the individual activities of ranking subjective preferences and applying instrumental rationality. His references to Descartes I take more as diagnostic tools than attempts to unearth the logical presuppositions of economic theory. In any case, it is by no means clear that mind-body dualism or Cartesian methodological reductionism²⁶ imply the utilitarian presuppositions of economic accounts of agency. Nor is it

²⁶ This refers to the Cartesian method of reducing dubitably complex ideas to their simple, clear, and distinct impressions or intuitions.

clear that a focus on preferences and instrumental rationality or an adherence to methodological individualism²⁷ presupposes mind-body dualism or methodological reductionism.

Thompson's picture of the epistemic and evaluative subject focuses on material, social, and cultural *practices*, as opposed to disinterested judgments or subjective preferences. As I read it, Thompson's commitment to embodiment serves two purposes. Despite some rather large inferential leaps, the general point of associating mind-body dualism with economic conceptions of agency seems to be that different assumptions about the relationship between subject and object would not support conceptions of moral agency and collective decision-making modeled on instrumental rationality. What Thompson wants us to see is that the individualistic, instrumental view of agency is not inevitable; it is, in fact, "the moral burden from which we must be relieved" by realizing that our moral lives are vastly more complex and integrated into the material and social circumstances in which we live, work, and play (Thompson 2010, 134).²⁸ For Thompson, seeing our moral subjectivity as primarily an exercise in preference satisfaction strips the objects and places with which we interact of much possible value. Such a position, he thinks, not only primes us to acknowledge only subjective preferences as true values, but fails to do justice to the post-modernist insights that norms are historically and contextually embedded: they get their valence from the relationships that they make possible and sustain. Thompson says:

[o]ur experience in twenty-first-century America is one of living in a commodified world, a world where we interact with one another by making constant trades. This commodification is the product of our material practice... As such, the habit of looking after our own interests has become engrained in us. Given that, it is natural that we might come to see ourselves as efficiency-maximizing subjects, choosing from an array of possible futures in the way we might select from an array of candy bars displayed on a store counter... But in fact, the counter is a place, and if we are looking at candy bars, our bodies are in that place. And the place fixes and determines our experience, not the other way around (ibid. 133).

²⁷ Methodological individualism refers to the choice of economic modelers to explain the operation of markets as well as to prescribe changes thereto in terms of the preferences of individuals, aggregated over a population. This approach was a response in the social sciences to abuses of concepts of 'collective spirit,' 'community identity,' and 'social good' at the hands of totalitarian regimes. In this aspect, the position is based on the normative consideration that an approach that accepts individual preferences uncritically (so long as they do not involve the infringement of fundamental rights) is less amenable to paternalistic and totalitarian cooptation and is more closely aligned with the moral pluralism of modern liberal-democratic society.

²⁸ Here we see one aspect in which Thompson's account might be interpreted as genealogical in something like a Foucauldian or a Wittgensteinian way. Although neither Foucault's focus on power nor Wittgenstein's focus on grammar seem exactly to fit the strategy, here, there appears to be a family resemblance that is worth philosophical inquiry.

The second purpose served by the concept of embodiment is to associate our moral agency closely with the particular objects, people, and experiences that have shaped our personal histories. Thompson seems to think that embodiment can be cashed out at the intersection of something like a Husserlian or Heideggerian phenomenology and Dewey's pragmatism. Although Thompson refers to Husserl, Heidegger, and twentieth-century German philosophical conceptions of the 'lifeworld' as providing grounds for the claim that Cartesian subject-object dualism is the product of a contingent intellectual tradition, Thompson's own characterization of an alternative seems to draw heavily on ethical pragmatism in the Deweyan tradition.

This view of morality focuses on the way in which norms make possible various social forms of life. To use a Wittgensteinian analogy, norms are like yard sticks: their size, shape, and material constitution are not forced upon us by some objective reality, nor are they just products of individual subjectivities; rather, they are means of representation that allow us to do a variety of things in the world with others. To the extent that moral norms produce barriers to doing something that we feel compelled to do, there is room for criticism and redesign (by analogy, measuring a curved surface or in finer detail). For example, thinking of moral decision-making in terms of instrumental rationality and regarding moral values as subjective preferences allowed researchers to avoid charges of paternalism and measure collective values in an objective, quantitative way – viz. by aggregating preferences. But understanding our moral lives in this way has tended to erode broader senses of obligation, responsibility, and agency, focusing our attention away from "examining the question of what we *should* want or what needs will actually turn out to be most satisfying" as well as the kinds of practical and social conditions required to produce individuals who want and are satisfied by the things we identify (ibid. 61). These questions, Thompson thinks, require that we represent moral norms as operative and applicable in our lives in ways outside our individual rights or aggregated preferences.

For Thompson, the meaning and justification of norms is indelibly connected to the process of inculcating members into a social group, maintaining levels of social cohesion, undertaking public projects, determining collective identities, and the like. The 'substrate' of norms, so to speak, consists of the way in which certain objects command certain kinds of attention and action, the power structure of relationships, the composition of our narratives wherein we prioritize certain outcomes, and the like; or in other words, the basic habits and

practices that allow us to do useful things with language, objects, and people. Hence, to challenge a norm, we must show how it conduces to certain practical problems that can be dealt with only by abandoning or altering the normative structure that gave them rise: we must show why a certain means of representation fails for some important task. For this, Thompson relies on the tradition of agrarian social critics like Wendell Berry and Albert Borgmann, who see modern neoclassical economics (or ‘capitalism’) as leading to rampant commodification and, concomitantly, a society plagued by alienation, purposelessness, and meaninglessness.

The increasing commodification of life in capitalist societies, Thompson thinks, proceeds through the creation of goods and services that have three important features. First, increasing the *Alienability* of a good or service means that it can be more easily separated from other goods of the same kind or from the person and context of its creation (ibid. 123). Thompson’s example is recorded music, which can be bought and sold as a good cleanly separated from the people who produced it or the context of its production. Second, market-driven technological change seeks to increase the *rivalry* between goods, which refers to “the way goods have incompatible uses, forcing people to the market to buy them more frequently” (ibid. 123). Thompson refers to terminator seed as a classic example of a technology that partitions off one capacity of a good, its plant-growing potential, and makes it incompatible with another, its reproductive ability, forcing the farmer to the marketplace for both services. Lastly, capitalist technologies seek to decrease the cost of preventing individuals from accessing a good or service for free, thereby increasing their dependence on the market structures that provide it. Thompson’s example of so called *exclusion cost* is the cost of fencing off an area, perhaps so that visitors will be forced to pay a premium for access.

The commodification of life that Thompson sees as hollowing out the moral psychologies of modern individuals is motivated through an analogy. This analogy contrasts the kinds of relationships to objects that Thompson associates with embodiment against those that he associates with the alienation or estrangement that he thinks is produced by commodification. The hearth analogy exemplifies the embodied, place-based relationships with objects and people that Thompson thinks are a) an antidote to modern social and environmental problems associated with an individualistic, atomistic, consumerist culture, and b) modeled well by agrarian ideals.

3.1.1 *The Hearth Analogy and the Embodying Effects of Focal Practices*

Thompson uses an analogical contrast between the hearth of old and the modern central heating system²⁹ to show how certain kinds of practical relationships with objects tend to give them as well as the human relationships that they necessitate a kind of significance that they lack when they are commodified. According to Thompson, the hearth was a ‘focal thing’³⁰ in the sense that it was a centre of human activity that brought people together to cook, relax, and keep warm. Tending the hearth was a ‘focal practice’ in that the value of the hearth reverberated out into the world: to the wood required to fire it, the activities and implements required to tend it, the seasonal cycles of harvesting, splitting, and stacking, etc. To the extent that these activities also required cooperation and collaboration between people, they built and sustained a set of relationships. Thus, Thompson takes the notion of ‘focal practice’ to mean “established habits of living that impart *broader* meaning and purpose to people’s lives” (my italics, Thompson 2010, 112).

The introduction of the central heating system, however, is supposed to have transformed this rich matrix of relationships into a series of economic transactions: one pays a technician to install it, then pays for the delivery of the fuel to run it, and pays to have it maintained. These relationships are supposed to be highly alienating, compared to a home-built hearth, because the purchase and use of the furnace is related to its producers and context of production only via the cash exchange that precipitates its installation. The idea, here, as I interpret it, is that building something oneself (or better, with family or community members), servicing it oneself, and furnishing the materials needed to run it makes one see the product in a different aspect: it becomes a source of pride and understanding; one recognizes one’s struggles and efforts in the details of its structure and function; one feels connected to the thing as an artifact of the development of one’s identity and skill; one has a more realistic picture of the kinds of efforts, materials, and social dependencies required to sustain the service it provides.

At the same time, central heating systems display a high degree of “rivalry”. To heat one’s house, one buys a furnace. To cook one’s food, one buys a stove. To warm one’s toes, one

²⁹ There is a noteworthy irony in Thompson’s use of this analogy: Thompson relies on the example of a thermostat to explain the concept of integrative sustainability. It is somewhat odd, therefore, that the potential of the central heating system as a model of sustainability does not temper the force of his insistence that such technologies are inherently purveyors of commodification.

³⁰ The concepts of a focal thing and focal practice are borrowed by Thompson from Albert Borgmann’s (1984) study *Technology and the Character of Contemporary Life*.

buys a space heater. For ambiance, one buys a gas fireplace. Hearths, by contrast, can do all of these things at once, cutting off at the pass the multiplying dependencies on the market of the furnace owner and forming a nexus where these joys and comforts reinforce one another and extend value to the less hedonistically pleasurable activities required to procure them.

The result of a world that is increasingly structured by highly commodified objects and relations, according Thompson (via Borgmann), is that individuals' moral selves are emptied of the practical and communal contents that once enriched our lives. We are turned into isolated bundles of preferences, responding to objects and places primarily in the consumptive mode: objects and places appear primarily in their economic aspect, as commodities that are available for the creation of pleasure. But what we find if we follow this trend, thinks Thompson, are lives bereft of edifying purpose and significance. In Thompson's words, "[t]he entanglements and complications of working out our material lives – eating, staying warm, getting dressed, cleaning up – may seem annoying, but one may find that being relieved of these entanglements and complications leaves one disembedded, alienated, and adrift" (ibid. 284).

The claims of this sections are, in sum: first, that the neoclassical concept of economic man, as it stems from the market system and permeates our culture, tends to erode more robust and satisfying conceptions of self. We become focused on consumption and subjective preference satisfaction. In the second place, the claim is that a sense of self that recognizes values external to one's own psychological economy and, in particular, perceives communal, historical, and place-specific values as making an important claim to one's attention and action leads to better moral character and a more satisfying life. Crucially, Thompson thinks that these further values are distorted when represented as preferences or interests to be maximized via instrumental rationality. This is because attending to the conditions under which they emerge and are maintained shows that they are integrated in a far more complicated way into our social and practical endeavours. Here, the particularly agrarian claim is that the practical organization and technological characteristics of one's life have a crucial role in forming individuals' moral character (ibid. 145). This latter claim requires further elaboration, and it is to this task that I now turn.

3.2. The Habitual Grounds of Intrinsic Values and Focal Practices

To begin with, consider a pragmatist insight into the way in which shared practices, social norms, and individuals' beliefs interpenetrate. An example is the role of the family dinner

as a “sacred site of communion” (Thompson 1995, 19). Values such as the importance of sharing, good manners, self-control, and sociability are all taught, reinforced, enacted, and justified through our relationships with food. We learn not only how to act appropriately in practical contexts of preparing and sharing food, but we see the value of doing so directly through the positive and negative outcomes of our actions. Being held responsible for cleaning up a mess that we have made shows us the value of good manners or established procedures for food preparation. Having dessert withheld from us when we greedily hog a cherished dish teaches us the need for sharing. Being made to wait until after guests have been served to eat teaches self-control, hospitality, and respect. In these cases, though language may be used to get the message across, the important sites of ethical convergence are practical; in these moments, we are concerned to reinforce norms that are centrally concerned with *doing* things in certain ways.

The agrarian insight, here, shares affinities with the modern work in discourse ethics from authors such as Jürgen Habermas and Rainer Forst. For discourse ethicists, intrinsic values can be derived from basic language-embedded norms that provide common ground for communication and sociability. The norms that govern what counts as a satisfactory explanation or justification of one’s action, for example, embed basic measures of respect as conditions for their meaningfulness. For, feeling compelled to explain oneself implies a measure of care for the perceptions and opinions of others. Justifying one’s actions would be pointless if one did not care what others thought. To use Thompson’s example, it would be a basic language-embedded norm of a whooping crane society that whooping cranes are valuable and worth preserving; in effect, this goes without saying. Community identity and the ability to navigate initiatives and have constructive conversations depend on this universal assumption. To challenge it is to signal that one is not a group member and precipitate either a “search (perhaps futile) for some larger, more encompassing intrinsic value or perhaps a slow indoctrination into the ways and practices of whooping crane lovers that ends with community enrollment” (Thompson 2010, 143).

The agrarian insight, according to Thompson, is that since doing and saying/ thinking are so intimately connected, material practices are as important for shared meaning and understanding as are linguistic ones. Indeed for Thompson, “it is these relatively unreflective daily routines that make more philosophically and politically potent notions of community *possible*” (my italics, *ibid.* 153). I take this to mean that shared habits and practices embed

norms, and sharing these norms gives us crucial pieces of common ground from which to build more abstract, collective senses of identity and purpose.³¹

Now, for Thompson, since food practices join communities to agricultural practices and the land through systems of production and distribution, how we go about acquiring food, what food choices are available, how we develop a sense of communal cuisine, what is seen as healthy food, how we are affected by seasonality, and the like are all crucial sites at which more high-minded environmental values can be developed and sustained. Developing and sustaining particular values will require that we organize our communal practices in ways that make these values seem natural and necessary for our daily, weekly, and yearly projects to go well.

On this picture of the relationship between the moral subject and her community, the notion of an intrinsic value as something that makes a claim on individuals independently of anyone's preferences or desires is given a subtle elaboration: Intrinsic values are those that no one in a given community feels compelled to challenge because they form the basic conditions that make the community a meaningful and purposeful entity (ibid. 142-3). This does not mean that they cannot be challenged. Indeed, Thompson's task is partly to challenge the unquestioned fundamentality of subjective welfare interests constrained by respect for human rights in our modern moral outlook and practice. The point, as I interpret it, is that such challenges in the form of *reasons* to believe or behave differently than we do can only get us so far. It is one thing to buy into the narrative that rational self-interest maximization tends to hollow out our moral psychology, but another altogether to begin seeing things as valuable in new ways. For the latter, we require more comprehensive changes in our cultural milieu. And this displays the independence of such value orientations from the moral subjectivity of the individual that underwrites ascriptions of 'intrinsic value.'

According to Thompson, reinstating 'focal practices' of certain kinds is an important means for achieving and sustaining a more robust moral psychology in which environmental and communal values can (re)gain their status as intrinsic. I can discern three general properties of focal practices from Thompson's account that are meant to counteract forces of commodification and expand our moral economy in the desired way: First, they are supposed to encourage a skillfull engagement with an object, place, or person that is premised on its unique properties and

³¹ Think, here, of the way in which ethicists so often rely on practical contexts of choice to draw out our strong intuitions on a given matter. They then use these intuitions to argue in favour of adopting some theoretical outlook or principle that is supposed to make sense of our practical intuition.

potentialities (ibid. 113, 115). As with the hearth, yeoman³² farmers practice ‘focal farming’ in the sense that they are supposed to be attuned closely to the intricacies of their land and animals and must possess considerable knowledge about them to husband well. However, the mechanized, computerized, modernized farm is supposed to have mediated these particularized relationships with commodities such that “any idiot... can buy the management skills associated with precision farming,” leading the farmer increasingly to interact with his land and animals as inputs or production units whose value consists largely in their conduciveness to profit (ibid. 119).

Second, focal practices “unify and harmonize fragmented experiences into a more satisfying whole” (ibid. 111). They are supposed to do this in at least two ways: (a) by making the value of one aspect of experience obvious relative to another, and (b) by spreading the value of each element to the others. Focal farming, for example, is supposed to unify experience in the sense that it makes obvious the dependencies between the unique characteristics of a place’s topography, soil type and quality, weather, seasonal cycles, ecology, and the like, and the human activities that transform them into life-sustaining goods and services. On the modern industrial farm, Thompson thinks, the line of dependencies leads most obviously to the local farm supply outlet and the supply chains that keep it stocked with affordable goods, thereby masking the farmer’s more fundamental dependence on her land.

I take the second mechanism of harmonization to be a product of the first. Where we have an intimate connection to the various tasks, materials, and natural processes that are required to produce a good, these tasks, materials, and natural processes enter into cultural narratives that are supposed to protect them against the “technological diremption into ends and means” (Borgmann in Thompson 2010, 115). Thompson seems mostly to assert this. But the idea, at least in the case of focal farming, seems to be that the farm system directs farmers’ activities, as it were, from without. The integrity of the system, its reproductive cycles, tie the value of each task into a system that has no clearly separable ends or means (Thompson 2010, 115). And a task is valuable not just because of its proximate effect, but because of its role in a web of other valuable processes that keep the system going.

³² I use this term, along with Thompson, in the American tradition, where it was used to refer to non-slave holding, small landowning, principally subsistence family farmers with early settlement technologies such as horse-drawn moldboard plows, cultivators, hay rakes, etc.

Third, focal practices are supposed to organize human behaviour into relationships of mutual dependence that are at once localized and small enough in scale that they are easily discernible, thereby clearer targets of respect and care, while also disconnected enough from other social groupings to be distinctive and self-sufficient (ibid.115). Yeoman farming technologies and practices, for Thompson, created a social organization of small, decentralized communities that centered on food and fiber production. Each role in the farming community had significance beyond the satisfaction of individuals' preferences: it was a discernibly necessary part of local collective subsistence. These manageably scaled relationships of mutual dependence and shared fate, the story goes, underwrote values of respect, care, conviviality, reciprocity, loyalty, humility, responsibility, hard work, and discipline, each of which having a unique character based on the particularities of the people and places in which it existed (Thompson 1995, 80-1).

It is important to note, at this point, that although yeoman agriculture serves as an exemplar for Thompson's discussion of focal practices, I do not take him to be advocating a return to the technologies and social institutions of 19th and early 20th century America. The picture we have been painting is romantic, but it is not univocally so in Thompson's writing. Thompson acknowledges the troubling aspects of agrarian societies of old: xenophobia, ignorance, patriarchy, poverty, bondage (Thompson 2010, 117-18). So Thompson clearly does not think that virtue accrues uniquely or necessarily through participation in 19th century yeoman technologies or social institutions. However, he and his ken are interested in separating out the focal aspects of yeoman farming whose loss has led to the "disappearance of place, dissolution of community, and dissipation of human virtue" (ibid. 118). Though it is not entirely clear how Thompson can navigate this tension, the edifying moral upshots of focal practices are supposed to accrue, as we have seen, when they are directed at a given object, place, or person in a way a) that is attuned to its unique characteristics and unmediated by forces of commodification, b) that values it according to its role and character in one's shared form of life and not merely as a means for satisfying one's subjective preferences, and c) that is localized and scaled down enough that the dependencies and mutual interests of the systems that sustain it are obvious and accessible for careful stewardship.

3.3 Habits, Moral Character, and the Agrarian Virtues

So far, we have been constructing a picture in which particular kinds of practical engagement promote particular value orientations, one's that Thompson thinks of in terms of embodiment and embeddedness in a place. Moreover, we have explored the claim that agrarian practical engagements with local places promotes a moral psychology and communal moral ecology that is more robust and satisfying than that given rise by the practices and routines of modern industrial agriculture. In Thompson's words:

The overriding moral concern that emerges from the agrarian mindset is one focused on the way... quotidian material practices establish patterns of conduct that are conducive to the formation of certain habits. These habits become natural to people who engage in them repeatedly and become the stuff of personal moral character. When such habits are shared throughout a locale, they form the basis for community bonds and become characteristic of the residents. The activities of food production and consumption are strongly tied to repetitive material practice. Furthermore, these localized practices are shaped by tradition and geography, by soil, water, and climate conditions (Thompson 2010, 39).

For Thompson, central to the agrarian approach are the notions that "morality could be rooted in the work experience of rural people" (ibid. 104) and that "[a]grarian stewards allow nature to have a strong voice in choosing our goals for us" (ibid. 83). What this is supposed to mean is that there is a certain kind of virtue, one that is currently lacking in urban, capitalist societies, that a rural agrarian lifestyle typified by focal practices of food and fiber production is uniquely positioned to create, and that this virtue is desirable for the world that we live in today. I turn now to an exposition of the key agrarian virtues that Thompson sees as offering guidance for navigating modern environmental and social problems.

3.3.1 Stewardship

Agrarian stewardship, for Thompson, embodies a set of habits of thought and action that play crucial roles in the formation of a wide array of other virtues. Critical in the context of environmental ethics, agrarian stewardship is supposed to reconcile the tension between the self-interested need for the farmer to produce and the need to be attentive to ecological health (Thompson 1995, 74). Thompson says:

[s]tewardship means using nature for human flourishing rather than preserving it in a museum, but it also implies a fine appreciation of the constraints implicit in the ecosystems where human life exists... Far from seeing nature as something to be deployed or mastered, the agrarian steward looks to nature for a sense of place, an

understanding of the underlying structure that informs personal values and gives meaning to human life (Thompson 2010, 82).

In Thompson's earlier work, he seems somewhat more worried about the fact that stewardship, as a form of elaborated prudence, is fundamentally rooted in human interests (Thompson 1995, 83-92). A farmer's self-regarding interests are spread to her agro-ecosystem by attending to it as a focal thing; that is, by carefully and laboriously seeking fulfillment from it in accordance with its unique capacities. The long-term integrity of her agro-ecosystem is meant to become her interest by way of recognition of her dependence on it (ibid. 74).

The first worry is that, so described, stewardship is not even a properly moral notion, since it extends the purview of an individual farmer's interests to her agro-ecosystem, but appears to remain purely self-regarding. However, this problem can be remedied, Thompson thinks, by focusing on the way in which good stewardship practices must be integrated into a social ecology along with the natural one. On this view, farmers rely on property rights, their familial relationships, community services, and the cooperation of other local farmers to be able to steward their land well. Hence, the farmer's abiding stake, via her land, in the "long-term stability and protection" of the local political community transforms self-regarding into other-regarding interests (ibid. 78). And where communities are meaningful entities that contribute to a farmer's sense of identity and purpose, the interest of each farmer in the stability and health of her region – ecological, economic, and political – is transformed (ta da!) into an obligation to farm well so that the effects of one's farming practices are not a detriment to others' (ibid. 86-7).

The second problem is that stewardship seems to remain at odds with the preservation of *wild* ecologies: if stewardship is rooted in prudential considerations stemming from a farmer's subsistence interests, then the value of nature seems to be primarily derived from its ability to satisfy these interests via farm production, and not from what it is in its own right (ibid. 87-8). We will then have reason to preserve it only for the sake of future farm production. Thompson's resolution of this problem is a little less clear. He refers favourably in his early work to Wendell Berry's reliance on human aesthetic interests and the need to understand the workings of wild nature to be able to steward well (ibid. 91-2). However, his later work seems to rely on subtly different formulations of these views. First, Thompson moves away from references to aesthetic values and embraces Albert Borgmann's notion of a focal practice, as we saw earlier. Second, Thompson imputes to agrarians an implicit ecological knowledge of the structure of socio-

natural dependencies and reciprocities that are required to keep a farm community going. It seems best to think of this as a kind of knowledge how, which is relevant to managing a farm system, as opposed to the explicit knowledge gleaned from ecological theories and models. And this practical know-how is supposed to prime those with agrarian lifestyles to be able to see how their sense of place, purpose, and identity is dependent on and developed out of the natural capacities of local wild ecologies.

Now, it is not immediately obvious why small-scale, diversified, family owned/ operated farming practices should be *uniquely* positioned to promote care and concern for cultivated and wild ecologies as well as a satisfying sense of place within them. Although Thompson does not make clear the mechanism according to which practical know-how gets transformed into communal and natural values politically endorsed, he does offer the following account of how industrial farmers' interests become divorced from the land.

First, industrial farmers require the land to remain productive only long enough for them to amass enough capital to be able to buy more, augment the land's productive capacity by purchasing technology or inputs, or invest in a more profitable enterprise (Thompson 1995, 84). This means that industrial farmers are not incentivized to think about the integrity of the land over the long term. Second, the farmer's dependence on land and ecological processes is mediated by capital (ibid. 85). When a farmer's interests are served primarily through the profit-motivated trading of commodities, thinks Thompson, the particular aspects of the land's fertility that produce the basic stuff of subsistence is no longer the focal point of farming. Rather, patterns of supply and demand, the productivity of the competition, and the profitability of employing various technological production methods become the farmer's focus. Farmers need not pay the same attention to balancing cropping activity with the generation and application of fertilizer from pasture lands via livestock, since it is generally more profitable to specialize one's infrastructure to produce one or the other, buying required nutrients or feed as inputs.³³ Because of this, Thompson thinks, the land and elements of its fertility appear primarily in their aspects as exchangeable commodities that can be replaced by capital. The farmer is supposed, therefore, to see herself as more dependent on capital than ecological resource flows. Her interests align

³³ See, for example, Slade and Hailu (2014) for an economic analysis of the competitive advantage of specialization in the dairy industry. Note, however, that where competitiveness is defined solely in terms of year over year profitability, possible benefits of diversification such as security and cost regularity of input supply, control over input quality, reduced carbon expenditure in transportation, variety in land-uses that can be tailored to different farm ecotopes, less monotony for farm workers, and the like are all ignored.

themselves with the exigencies of the marketplace to the detriment of ecological and communal knowledge and values: whereas small-scale, diverse, self-reliant farmers are incentivized by their interests to steward well, “the economy promises to select in favour of farmers who maximize profits through the aggressive application of technology” (ibid. 84). One sees this in the example of the moral deferral of farmers to the marketplace cited in section 1.2.3: “[w]e are not driven by ideological concepts, political correctness or environmental persuasions; we are driven by the marketplace. Farmers always respond to incentives in the market and will produce sufficient food using combinations of conventional and organic methods to maximize their individual net returns” (Hendrix 2007, 85; in Badgley 2007). The Industrial agriculturalist is thus supposed to see herself as primarily an economic actor, thereby unmooring her interests from anything but capital.

3.3.2 Self-Reliance

Self-reliance is the second key agrarian virtue. Most generally, “[s]elf-reliance,” for Thompson, “is a habit of personal initiative but also a habit of relying on one’s experience rather than on conventions” (Thompson 2010, 83). Now, one important element of self-reliance has already come out in our discussion of stewardship: this is that self-reliance is the antidote to the stewardship-corrupting evils of market-reliance. In this respect, self-reliance is a virtue that necessitates small-farm diversity: relying mainly on technologies and knowledge that a family unit can employ and providing a large bulk of one’s food and fiber needs directly from one’s own agroecosystem necessitates having a garden, keeping animals, maintaining a woodlot, managing one’s water resources, growing feed grains and hay, and many other practices besides. The habits involved in sustaining these practices, in Thompson’s view, have two primary effects on the character of farmers, aside from sensitizing the farmer to “nature’s feedback” via stewardship, that are germane for an agricultural ethic (ibid. 57). One is to prevent indulgence in consumptive excesses, and the other is to promote an edifying relationship with work.

First, self-reliance is supposed to make obvious the farmers’ points of dependence on ecological processes as well as the work and skill required to furnish life’s necessities and comforts. Here, self-reliance is proposed as the specific antidote to Leopold’s general warning of the “two spiritual dangers in not owning a farm,” which are “the danger of supposing that breakfast comes from the grocery, and... that heat comes from the furnace” (Leopold 1949, 6). The dangers are not supposed to be simply epistemic; rather, they are that, lacking a practical

acquaintance with what it takes, ecologically speaking as well as in terms of human sweat and community solidarity, to keep food on the table, individuals' natural desires to consume will become obsessive and insatiable, their demands on nature and the food system unreasonable, and their focus on their own subjective interests morally crippling.

For Thompson, self-reliant farmers exist within a practical and social ecology in which many opposing forces are supposed to keep them from developing excessive habits. Here, we encounter most directly an Aristotelian moral psychology in which excesses and deficiencies are conceived as deviations from a carefully curated balance in one's emotional responses and actions. Now, this balance is ultimately achieved, in Aristotelian ethics, through the skillful exercise of our rational capacities. However, the agrarian focus is on the notion that, in order to develop and maintain these rational capacities, one must first be habituated or trained in ways of thinking and acting that conduce to the development of dispositions that are not excessive or deficient (Kraut 2014). And this is done, for Thompson, by being situated within a form of life that incentivizes balanced habits and practices and disincentivizes excessive ones (Thompson 2010, 81). Agrarian self-reliance is meant to provide this structure by balancing our interests in pleasure, comfort, and consumption against an immediate acquaintance with the ecological processes, human labour, and social systems that are required for satisfying these interests. We are prevented from over-consumption, for example, by the knowledge that we will have to work harder than usual to procure the extra consumables, that our local ecologies will suffer degradation from overexploitation or excessive pollution, or that someone in our family or close community will be forced to do without. We are prevented from being overly individualistic, self-aggrandizing, or selfish because our self-reliance makes obvious our vulnerability and dependence on family and community members in times of hardship (ibid. 81). Self-reliance is supposed to have these effects because, in the management of a socially and ecologically embedded farm system, costs that are externalized, work that is deferred, errors that are not corrected all have tangible effects on the farmer's long-term ability to achieve a comfortable life.

Second, Thompson blends Wendell Berry's romantic picture of farm work with Albert Borgmann's account of focal practices to advance the notion that the character of work on self-reliant family farms forms a kind of ecology itself that disposes individuals to balance and the development of virtuous habits. The diversity of the tasks and the immediacy of the relationship between labour and its fruits, as we saw in the discussion of focal practices, are meant to give life

a kind of significance, a fulfilling quality, that working for a paycheck lacks (ibid. 83). Here, again, we encounter the notion that laboring for one's subsistence in all aspects of an agro-ecological system disposes farmers to "experience the broader implications of their acts" and provides many diverse opportunities to develop their identities through work (Thompson 1995, 79). For Thompson (via Berry), specialized, wage-incentivized work organizes workers' lives such that they tend to view work as means to the end of a paycheck and a weekend off. But to see work in this way neglects its potential as "a defining moment in the formation of character and identity" (ibid. 79). Thompson says that "[t]he rich array of productive tasks on the farm offer the farmer many opportunities for self-creation and self-expression through work" in a unique way that is not supposed to be so readily available to specialized agricultural employees or urban wage-workers (ibid. 80).

Note, however, that Thompson is using *self*-reliance fairly loosely. It is unclear exactly how reliant on one's individual self one must be in order for virtues to accrue. Thompson's characterization of self-reliance as "a habit of *personal* initiative" must be elaborated in light of his later claims (my italics, Thompson 2010, 83). The overarching point seems to be that smaller systems of human organization that rely more directly on a variety of particular ecological processes and social relationships in a way that is not standardized or mediated by capital exchanges tend to have a more nuanced and holistic sense of and respect for the socio-natural structure of dependencies.

3.4 Integrative Sustainability

So far, we have been exploring the notion that focal farming practices can be the purveyors of important ecological and communitarian virtues. Despite considerable ambiguity as to the mechanisms connecting focal farming practices and communitarian and ecological virtues, Thompson thinks that these virtues are cultivated through a close and attentive working relationship with the land. But of course not everyone can be or wants to be a farmer. And it seems unreasonable to suppose that environmental and communitarian virtues are simply out of the urbanite's reach, that true sustainability is only possible in the country. To circumvent such a conclusion, Thompson tries to bring together his preferred conceptual framework for assessing sustainability with his agrarian ideals, arguing that the ideals provide accessible, motivating proxies for more complex sustainability models. In this way, cultivating a culture in which agrarian ideals have resonance becomes a viable political approach to achieving sustainability.

The first move, here, is to adopt a conceptual framework inspired by ecology for thinking about sustainability, which Thompson calls ‘functional integrity,’ as opposed to the accounting-style framework of ‘resource sufficiency’ issuing from economics. Both conceptions of sustainability operate using complex models of systemic interactions. ‘Systemic interactions,’ in both frameworks, refer to relatively stable patterns of interaction between units of a system over time. The kinds of interactions of interest to those who approach sustainability through the resource sufficiency lens are primarily relationships of consumption to available resource stocks and, in the case of renewable resources, their rates of regeneration. Sustainable systems are conceived as those systems that consume essential resources at a rate that does not exhaust them over a given period of projection. What consumption patterns are seen as sustainable depends on the chosen time frame, the rate at which the resource is consumed, the quantity of available stock and/ or its rate of renewal, and one’s confidence in technological innovation to overcome eventual scarcity (Thompson 2010, 223-5).

The ethical rationale for measuring sustainability in this way is to protect the basic rights or maximize the welfare of current and future human beings (ibid. 225). Conceptions vary from weak to strong depending on how disconnected they view human welfare from actual stocks of resources: weak sustainability holds that no harm is done to current or future humans in diminishing or exhausting resource stocks so long as we can sustain those services essential to a basic level of human welfare through the application of accumulated capital (particularly as technology) to extending diminished resources or creating new ones (ibid. 230). Strong sustainability holds that natural resources have a welfare value that cannot be replaced by capital or technology, and thus that the rights or welfare of future generations is compromised when stocks of critical resources such as clean water, fertile soil, and genetic diversity are diminished, even if there is no effect on our productive capacity.

The functional integrity framework differs in two important ways. First, it focuses primarily on the capacity of systems to reproduce or renew themselves. The functional integrity approach assumes certain relatively constant inputs to a system and measures whether a system’s units are organized to interact in such a way that predefined performance criteria are kept within relatively stable thresholds (Thompson 1995, 155). Hence, it is necessary (a) to draw boundaries around a system such that some processes are seen to be internal and others external to the system’s functioning, (b) to define thresholds according to which the system can be said to be

functioning properly, and (c) to determine which systemic elements (units) and interactions are the ones that produce and sustain the system-level capacities that are identified as constituting proper functioning.

Second, methodological and moral values permeate the process of delineating a system, determining its performance thresholds, and grouping elements into measurable functional units. Delineating a system always occurs in the context of some sense of purpose for doing so. The goals of the researcher may be disciplinary, in the sense of advancing some modeling technique, they may be prudential, in the sense of warding off a potential problem, they may be personal, in the sense of being motivated by personal experiences and passions, or they may be moral, in the sense of stemming from some conception of what is expected, justifiable, right, or good in general. Likewise, defining performance criteria and categorizing system components into functional units occurs relative to some sense of what is interesting, useful, beautiful, or the like about the system under scrutiny.

Thompson's claim is that functional integrity is a more adequate framework for assessing sustainability for 3 reasons: first, "one philosophical advantage of functional integrity is that the language in which sustainability is articulated invests the system of interest with significance in an obvious way" (Thompson 2010, 251). This is because one must consider quite explicitly the reasons for delineating a system in a particular way and setting particular thresholds as performance criteria. On the other hand, assessing sustainability in terms of consumption trends and resource stocks tends to obscure the role that values may be playing by presenting the predictions as value-free scientific measurements. We saw how this can work in the analysis of the argument from production in section 1.3. Here, trends that seem dysfunctional are used as measures of the constraints under which agriculture must operate over a given period of projection. The normative upshot of the projections is a quantitative measure of the food that agriculture must produce in order to minimize starvation, without any justification for why our goals or policy interventions should be restricted to food production and not include, say, redistribution, population reduction, investment in infrastructure, etc.

Second, Thompson says that "[a]nother argument for resisting the dependence on science that is implicit in a resource sufficiency approach also points us toward functional integrity by stressing that key vulnerabilities reside in social (rather than soil and water) subsystems" (ibid., 251). The argument is that resource sufficiency measures tend to take for granted the social sub-

systems that animate vibrant agronomic research and rural social structures that are attentive to resource depletion, pollution, and degradation. But insofar as resource sufficiency measures often assume that scientists will continue to respond to scarcities and environmental problems perceived on the farm with technologies for their amelioration, they simultaneously ignore and depend on those complex social sub-systems that give scientists a reason to develop these technologies and the knowledge and values to do it well, as well as the rural values that keep farmers attentive to environmental quality (ibid. 251-2). Many sustainability advocates see the increasing trend towards market-driven scientific and agricultural institutions as making them more dependent on “an inherently risky system for regenerating financial capital” and less directly responsive to signals from environmental sub-systems on which farming ultimately depends (ibid. 252). The functional integrity framework is supposed to highlight the interconnectedness of these social and environmental sub-systems by turning our attention to how they are implicated in any attempt to draw boundaries and define performance criteria for our food production system. We might cut some of these sub-systems out, but we must do so by explicitly justifying our choice.

This second benefit is a particular expression of a more general one that Thompson sees in taking the functional integrity approach. This is that thinking in terms of functional integrity tends to push us to be ever-more inclusive in the way in which we draw our systems borders (ibid. 233, 246, and 248). This is because, as ecologists have long recognized, ecological systems, like social systems, interact and overlap in such a way that they do not come packaged and priced for our research convenience. Thompson is simply extending this point to show that social and natural systems also overlap and interact in ways that place the burden to justify her boundaries on the analyst who seeks to cut out a chunk for analysis.

Now, Thompson says that “[o]ne must understand sustainability at the level of the entire system in order to understand it at all” (ibid. 180). And the holistic, functional integrity approach is supposed to offer *empirical* benefits by highlighting the ways in which patterns of interaction are reproduced within a system conceived in a very inclusive way. But the decisive benefit of thinking in terms of functional integrity is supposed to be normative in that it forces analysts to conceive of performance criteria in properly systemic or collective terms: as social goals. However, the empirical and normative benefits that accrue to a holistic functional integrity model depend on the reasons invoked by the researcher to draw the boundaries very inclusively.

And as Thompson recognizes, there are plenty of good reasons to measure the sustainability of systems in ways that do not encompass all social and natural systems; the most obvious being that this is currently impossible. The trouble is that Thompson has not given us a clear set of social goals that he thinks ought to structure the way in which we go about modeling socio-natural systems. Not only that, he has not given us a procedure by which to determine what these goals ought to be. This means that, left in the hands of researchers in ecology, economics, agronomy, and the like, the most Thompson is in a position to prescribe is clarity regarding the normative assumptions that go into the models.

My sense is that Thompson would like to sidestep these problems through what comes next: by challenging the importance of technical sustainability models for public deliberation about sustainability via the paradox of sustainability, and by arguing that his agrarian ideals can operate as empirically adequate, motivating proxies that share important affinities with the functional integrity model. However, how far this approach actually gets us in terms of pinpointing the problems of sustainability for IA, as my analysis will try to show, depends on the kind of normative project that we attribute to Thompson: a formulation of agrarian interests and assumptions to serve public discourse or a substantive view about how farming contributes to the good life.

3.4.1 The Paradox of Sustainability

Although Thompson distances himself from a hard paradox in his later work, he wants to maintain the idea that, where interventions in pursuit of sustainability are concerned, “it is better to be lucky than smart” (Thompson 2010, 253). The idea seems to be that sustainability models, to the extent that they are more holistic and complex, will be less useful for guiding public policy and individual decision-making since they will not be parsable by non-specialists. Instead, “[i]f we have simple norms that provide little insight into the regenerative systems of ecology and society but that guide our behaviour in ways that allow those systems to function, we should retain those simple norms” (ibid. 253). Thompson seems to think that it is unrealistic to expect people to be able to understand complex functional integrity models of socio-natural systems in a way that can usefully inform their daily lives. And moreover, Thompson thinks that to adopt sustainability as a personal goal is to “commit a rather subtle logical fallacy” (ibid, 180). This is because it is neither necessary nor sufficient for achieving sustainability, if we think of it as an attribute of holistic socio-natural systems, that an individual intend her actions to be sustainable.

Hence for Thompson, not only are complex models that unearth the ecological and social conditions that must obtain for us to achieve some ideal relationship with ecological systems too complex to help guide our behaviour, but adopting ecological values in one's personal life as an attempt to advance the cause of sustainability provides no guarantee that we are actually doing anything for sustainability at all.

However, Thompson does want to hold onto the functional integrity framework as an important piece of conceptual architecture that can inform discursive processes of moral deliberation. But since a comprehensive system model is not supposed to be much use to those of us who cannot run the numbers or understand the theory, we must formulate our ideals and principles in more familiar terms. Thompson says: “[m]y argument is that the systems-modeling approach yields an informative and normatively more adequate *conceptualization* of sustainability, one that gives us a better sense of what we are shooting for, one that helps us better understand what our adjustments, approximations, and ameliorative strategies should be striving toward” (original emphasis, *ibid.* 254). As a kind of ideal structure or general framing of issues of sustainability, Thompson seems to think, functional integrity “yields a conceptualization more adequate to the task of reforming conduct and policy” (*ibid.* 254).

The details of how using the functional integrity framework as a general conceptual guide as opposed to a fully specified empirical model is supposed to work and how it is supposed to help us to navigate with our vague ideals is still pretty unclear. Although the next section makes an attempt to clarify these issues to some extent, it is useful to note that there is a persistent tension, here. If functional integrity models are the way to understand sustainability, then it seems as if we will want to specify our ideals in terms of indicators and performance criteria that are quite specific. But if it is unrealistic to suppose that technical measures that proceed according to specific indicators can usefully inform non-specialists' behaviour and be motivationally potent, then it is not at all clear in what sense the functional integrity framework can add to our pursuit of sustainability. It seems that we might as well adopt any old set of vague, romanticized ideals and hope that we don't end up destroying ourselves.

3.5. The Role of Agrarian Ideals

Now, it is because of this difficult relationship between the kinds of concerns and considerations that speak to us in familiar terms and the complex models that can tell us something about the systemic conditions under which our concerns can be appropriately

addressed that Thompson recommends revisiting agrarian ideals, particularly the virtues of self-sufficiency and stewardship. According to Thompson, “the appeal to agrarian ideals can bridge the gap between abstruse theory and common sense” (Thompson 2010, 273), and this applies even to discussions of sustainability that take place between technical inter/ intra-disciplinary contexts (ibid. 272). Thompson sums up the reasons for this in the following way:

Agrarian ideals are relevant for social movements focused on sustainability because they model and make transparent the manner in which an existing way of life, conditioned and structured by its history as well as its environment, succeeds or fails to renew itself through cycles of time that can be measured week to week, year to year, or generation to generation. They illustrate how our personal and group identities are part and parcel of an ecology that begins in the natural order, and they make our collective vulnerabilities visible to us far better than do enlightenment ideals of equality, welfare, or human rights (ibid. 276).

One way of reading this passage makes it seem as if agrarian ideals are the populist version of the functional integrity framework. The argument then sounds like: if we can't understand the science, then at least we have agrarianism to tell us what to do. But this is not the most charitable or nuanced reading of the passage. Thompson is clearly pointing to an affinity between agrarian ideals and the functional integrity framing of sustainability. But we must keep two things in mind: a) Thompson thinks of sustainability not as a substantive value in itself, but as a state of affairs that, when added onto morally desirable social organizations, makes them better; and b) the functional integrity framework helps to clarify and uncover the functional conditions of our values, but does not itself prescribe. However, agrarianism is a rich moral and political ideology that *does* recommend substantive values. Moreover, agrarianism turns our attention from attempts to rationally ground moral principles or decision procedures to the habitual and practical grounds of virtuous dispositions. It is this shift in attention, I think, that is supposed to forge the connection between functional integrity and agrarian ideals. Thompson's agrarian ideals stress the way in which certain kinds of practical relationships amongst people and the places where they live breed citizens more attentive to environmental concerns and issues of social cohesion and community vibrancy. In this way, they turn our attention to the non-rational communal features that help us to adopt and pass along environmental values.

Thompson says:

A properly functioning food system could serve as model for sustainability itself. Participating in a well-integrated agrifood system could give everyone a vantage point that relies on a set of practices and institutions that renew themselves in economic,

ecological, and social terms. If the operations of this system are sufficiently accessible and transparent to food consumers, obtaining and eating food could become a practice that reminds people what sustainability means in a substantive sense (ibid. 192).

But agrarianism invokes the functional integrity framework, in part, by stressing the practical virtues of stewardship and self-reliance. Images and narratives that present a life structured by these virtues as more satisfying and meaningful are supposed to lead us towards sustainability. Whereas invoking functional integrity models, for Thompson, may not be the most effective means of achieving sustainability, agrarian ideals offer a “more than plausible” value orientation that both turns our attention to issues relevant to achieving sustainable societies, and embodies a set of values that can be communicated in terms that are familiar and motivating (ibid. 273). On the one hand, agrarianism shifts the focus from individual rights and preferences to formulations of a communal ideal; and correlatively, from rational means-ends or cost-benefit calculation to the way in which our moral characters are shaped and maintained by certain relationships, habits, and practices. On the other hand, agrarians appeal to concepts of balance, stability, harmony, communion, embeddedness, and integration, as well as highlighting the particular relationships that have made us who we are and the responsibilities we accrue in light of our acknowledging and respecting them (viz. our ‘place’). These concepts are motivationally potent in a way analogous to the utilitarian focus on suffering or the deontological focus on freedom. They issue in descriptions of our moral psychologies and social predicaments and in the ideals that underwrite our sense of community. Thus, agrarian ideals are supposed to form a bridge to abstruse sustainability in two senses: they offer accessible models for thinking and acting in ways that more closely align with sustainability as functional integrity and they invoke narratives and arguments that provide motivating reasons to think and act in a manner consistent with the ideal-based models that we (discursively) construct.

3.6 Conclusion

The message of many agrarian writers in whose tradition Thompson is writing was that more people ought to take up yeoman agriculture for its morally edifying effects. Maximal participation in small-scale, low-input, family farming meant society would, on the whole, be a better place. This seemed to be the logical conclusion of arguments that romanticized rural life and denigrated urban industrialism, commercialism, and technocracy. However, it is clear that Thompson does not endorse “simple-minded exhortations to engage in farming” (Thompson

2010, 280). It is also clear that Thompson recognizes that, for a human population of 9 billion to enjoy a level of comfort adequate to satisfying the demands of basic human rights and welfare, most people must be engaged in industries besides farming and live in urban areas. Indeed, it is not entirely clear that Thompson's argument requires that we abandon some of the technologies and practices central to modern IA that have increased yields so dramatically, such as high-yielding varieties, machinery, and synthetic fertilizers and pesticides.

But Thompson does hold onto agrarianism in its most general expression: that farming is more than just another industry; it has a social and political role to play beyond its capacity to produce an abundance of cheap and nutritious food (ibid. 30). One of the primary upshots of Thompson's arguments is, therefore, an expression of agriculture's special social and political role *that does not require everyone to practice it*. This, as we have just seen, is in its capacity as an accessible, motivating model for sustainable living: “[a] good firm picture of what it takes to keep a farm going [provides us]... with an enormously useful set of metaphors for understanding what it takes to keep society going” (ibid. 3), and thus “a society's farming culture – its means of subsistence – reverberates through all its institutions” (ibid. 5).

But if many IA practices and technologies are still morally permissible and if Thompson's agrarianism does not result in the imperative for all to farm, then what *are* the implications for the way in which we currently practice farming? Thompson does not end his books with a set of sustainability indicators for agricultural policy creation or with an endorsement of organic or biodynamic agricultural principles. Rather, Thompson sees sustainability as an essentially contested ideal, like ideals of justice, equality, freedom, and welfare, whose value consists not in arriving at a definition once and for all, but in initiating a public process of deliberation about our collective goals for the management of socio-natural systems. Hence, he says that

[t]he solidarity and place politics celebrated in agrarian ideals must be understood as one thrust among many in a complex dialectic of democratic politics. Throughout, my hope has been to resuscitate agrarian ideals for the role they can play in environmental ethics and the political pursuit of sustainability. I see them as offering important counterwisdom to political excesses that occur when utilitarian, libertarian, and egalitarian ideals – the philosophical ideals that underlie the industrial philosophy of agriculture – become dominant in the shared vocabulary of a people... A healthy conception of sustainability will arise when industrial and agrarian ideals are incorporated in the mix of goals, hopes, and story lines that shape our public life” (ibid. 289).

This seems to imply that Thompson is not engaging in a project to replace industrial with yeoman agriculture or do away with the economic measures of efficiency that provide IA with its normative rationale. Rather, he is trying to make a space in the conversation, research, policy, and practice for agrarian ideals and production systems. The idea seems to be that there is a healthy tension or balance between industrial invocations of human rights and welfare and the more communitarian and ecological values of agrarian thinkers (ibid. 43). One of the ways in which this tension has been upset is through the erosion of agrarian communities by the advance of high-input, large-scale, specialized agriculture; another, concomitant way is through the diffusion of a dualistic, atomistic, economic conception of the self and an additive conception of social goals (ibid. 61).

Thompson does, however, endorse modern enthusiasm for local, organic, and fair-trade agriculture as promulgating agrarian symbols and the practical grounds that promise to give them wider currency (ibid. 63). But he warns against the tendency of these movements to focus on worries about individual health and on mysticism regarding the forces at work in nature that promote health, since such an approach tends only to reify the individualistic, atomistic, preference-based ethic that provides the rationale for IA (ibid. 59). His vision for a future agrarianism is contrasted against his vision of a future industrial agriculture. The latter is portrayed as having become much more environmentally and ethically benign, developed technologies for smarter use of agricultural chemicals and energy, designed facilities for more humane treatment of animals, and perhaps achieved levels of mechanization that allow for the elimination of low-wage manual labour and an increase in salaries for farm workers. Indeed, Thompson suspects that future IA will need to respond to consumer demands for environmental and ethical services, in some markets, by becoming small and focusing on artisanal production methods. In many cases, however, the ethically and environmentally offensive practices of current IA will be replaced by practices premised on new technologies, such as the conversion of currently useless plant matter into food or energy via GM microbes or the growth of animal tissues in labs. However, agricultural corporations will develop and adopt these technological changes and the kinds of production practices that they permit simply on the basis of their profitability. Rural landscapes, like all of the resources required for food production, will continue in their aspect as one capital input among others. And rural lifestyles will wane, giving

way to the prevalence of the commuter farm in which owners and labourers alike live in urban centers and commute to work in the country (ibid. 63-4).

The picture of “Tomorrow’s Agrarians” that the foregoing five step reformulation of agrarian ideals is working towards is one in which they are environmental and ethical standard-setters, stewards of the rural good, cultural and environmental (ibid. 65). Sensible stewardship will involve setting up professional associations (or regional guilds) for deliberative land-use and production plans and standards. These associations will not be beholden only to standardizable regulations and consumer demand, but also to localized, collective ideals in realms of rural aesthetics, animal welfare, environmental quality, and the like. And farmers will promulgate the virtues of stewardship and self-reliance from which these ideals emanate via educational and recreational initiatives that provide space for urbanites to learn about and participate in food production and rural lifestyles. In this way, the land will take on a symbolic value as the site of subsistence even for those who do not spend their days tending it, providing them a clear picture of how their urban existence depends on and is integrated into the seasonal cycles of producing nutritious food (ibid. 65-6). The key difference from the industrial vision of the agrarian ideals that Thompson is trying to reconstruct is that agricultural production systems will be the purveyors of focal land practices for urban centres, forming the keystone of a culture attentive to the wellbeing of the land and the social institutions that permit this attentiveness. Agriculture’s special political role is, thus, to make our dependence on the land obvious and to help us formulate the meaning of sustainability in terms of the way in which local cultural norms, traditions, and technologies reproduce an attentiveness to the ecological cycles and processes essential for subsistence.

Chapter 4: Analysis

“Francis Xavier, the co-founder of the Jesuit Order, is supposed to have said, ‘Give me a child until he is seven and I will give you the man,’ but, frankly, any fool could have figured that one out. It’s what advertising is about, the training of generations of consumers who will remain loyal to particular products. And whether you like it or not, religion and culture are products. Just like hot dogs and frosted cereal”³⁴

4.1 Line ‘Em Up

As I indicated at the end of my discussion of DeGregori, I think that, at a general level of description, there is no necessary contradiction between the projects of these two thinkers. DeGregori operates with a minimalistic set of political values and shows how IA’s statistical pedigree illustrates its ability to realize them. Associating IA closely with science and technology allows him to claim that IA can achieve productivity increases even where these incorporate environmental values not captured by markets. This latter bit involves a commitment to a view of moral progress modeled on instrumental rationality. One problem arises when IA technologies are not invented, taken up, and used purely in pursuit of the full range of humanistic values that DeGregori associates with scientific institutions. Industrialism has been driven in large part by market forces subject to critical externalities in the realm of environmental and social goals. Addressing these externalities involves aligning scientific institutions, the public, and agricultural producers with values beyond subjective preferences and the profit motive. Moreover, engaging these externalities involves attributing a value to natural systems that do not have obvious or immediate welfare impacts on individuals. Thompson’s project is precisely an attempt to help us generate the conceptual and practical resources to properly engage values and ideals relevant to achieving sustainability. And it is not clear that either DeGregori’s stats or his ceremonial/ instrumental distinction can preclude Thompson’s project at this general level.

4.2 The Agrarian Trilemma

Thompson’s project is an attempt to show that there are certain modern agricultural problems that an economically-organized agricultural system founded in utilitarian and deontological ethical principles cannot adequately address. These problems might be grouped into two broad categories: a) providing citizens the motivation and practical know-how to address problems of sustainability, and b) providing policy-makers and researchers a set of ideals with which to conceptualize problems of sustainability in properly systemic terms. Attempts to

³⁴ Thomas King (2013), 110.

address these problems by revitalizing agrarian ideals face a trilemma that must be surmounted. I have hinted at elements of it by pointing to critical tensions and ambiguities in Thompson's account. The first horn I call 'historical inaccuracy,' the second 'rural romance,' and the third 'agrarian impotency.'

4.2.1 Historical Inaccuracy

Problems with IA appear against a backdrop of romantic images of rural lifestyles in which certain practical and social forms of organization ennoble participants and instill virtuous character traits, among which are stewardship virtues that balance self-interests against environmental values, and communitarian virtues that balance individual welfare considerations with respect and care for communal institutions. Now, as Thompson recognizes, these images leave out the nastier elements of the farming communities promulgated by American agrarianism's patron saint Thomas Jefferson. These included persistent environmental problems such as soil erosion, biodiversity loss, and general ecological degradation; economic problems like extreme poverty, onerous working conditions, inequality, and a lack of social mobility and meaningful economic opportunity; and social problems like xenophobia, gender oppression, and a lack of education (e.g. Ling 2004, Mayes 2014, or Temple Kirby, 1996).

I take Thompson as trying to sidestep this problem by acknowledging that his ideals are romantic. I criticize this move in a moment. Here, I want to point out that the historical inaccuracy problem cuts a little deeper than Thompson acknowledges. To see this, consider the centrality of agrarian focal practices to agrarian ideals. What Thompson is recommending is a set of ideals that highlight the way in which properly structured communities and particular practical engagements with nature can create desirable moral psychologies. If we are to take Thompson's historical-looking account of focal practices as evidence that the change from yeoman farming practices to industrial ones was the cause of moral decay, then we want to know what to make of all the environmental, economic, and social problems that existed in yeoman communities. The trouble is that the agrarian account of the relationship between practices, habits, and moral character makes these especially hard to sidestep. This is because it departs in crucial ways from the common-sense view invoked by virtue ethics.

The common-sense, virtue-ethics story is that practices that are governed by praiseworthy norms, when they are engaged in repeatedly, become habitual in the sense that they become automatic response patterns triggered by certain contextual cues. These automatic responses,

taken collectively, form important elements of one's personality, contributing to one's overall virtuousness or flourishing. Hence, to the extent that society is set up according to praiseworthy norms, it should tend to produce virtuous individuals. But agrarians like Thompson are proposing that practices and forms of communal organization characteristic of yeoman farming embody *implicit* norms that instill in us certain habits that contribute to virtue.³⁵ It is these practices (or even just images or narratives centred on them) that conduce to moral virtue. This kind of a position is especially vulnerable to charges of historical inaccuracy because it associates practices, habits, and norms very closely: it proposes that virtues are generated from certain kinds of habitual practical engagement because the *practices produce habits* that embed certain norms all by themselves – e.g. practical dependence on agro-ecosystems attunes us to ecological integrity and transforms our self-interest into environmental values. Taking this tack makes it very hard to explain away instances in which agrarian societies were a far cry from models of sound ecological management or communitarian virtue. This is because it is not clear why we should think of the good norms as the ones implicit in agrarian farming practices and communities and not the unsavoury ones. Why should we think of agrarian societies as any more conducive to agrarian virtues than agrarian vices?

If we are going to give this kind of view any particularly agrarian teeth, we need to know how it is that yeoman agricultural practices embed norms and by what psychological mechanisms these norms become habitual and eventually ideological. Moreover, we need evidence that focal farming practices are a) unavailable to farmers who operate using industrial technologies and organizational principles, and b) uniquely connected up with the kinds of moral psychologies that we are after. It is my sense that the virtues of stewardship and self-reliance are better characterized as results of processes of education and enculturation that explicitly teach environmental and communal values. There is no obvious reason, to me, to think that the scale or technological characteristics of one's farm have any necessary connection to a moral psychology alienated from nature and community. Where markets tend to have these effects, as I suggest below, it is because they actively promulgate self-regarding, individualistic norms.

³⁵ At its most extreme, agrarians hold the view that technologies can be coupled with impacts on labour practices in a way that forces certain habits (and eventually even values) on the operator (See Boyd 2005, 220-227). Hence, that factories are often boring, alienating places to work is a reflection of the impact of the assembly line, not the long hours, low pay, working conditions, extreme job specialization, or the like.

4.2.2 Rural Romance

At best, Thompson's ideals are meant to model neglected values embedded in North American cultural identity. These values are meant to counteract individualism and consumerism and reconnect our sense of purpose and identity to natural places. Thompson wants to deal with those social and environmental issues best addressed using utilitarian and rights-based concepts by affirming a healthy tension between these and agrarian moral perspectives. He seems to want to think about the relationship between these moral perspectives as a kind of dialectical movement that will achieve some resolution through public discourse in which all kinds of values are represented (Thompson 2010, 41, 289).

The trouble is that it's not clear that vague, romantic pictures proposing an unspecified mechanism that links the work experience and community structure of yeoman agricultural societies and environmental and communal value-creation are the best way in which to communicate or motivate these values. It seems uncontroversial to claim that engaging with the natural world, through agriculture or otherwise, *has the potential* to be a source of profound meaning and satisfaction in one's life. Likewise, it is uncontroversial to claim that we *can make* agricultural practices and institutions centerpieces in our communities and means for reproducing environmental and communitarian values. It also seems uncontroversial to claim that people who derive satisfaction and significance from nature will be much more attentive to it and much more motivated to care for it. Furthermore, it is obvious enough that those who have more scientific knowledge of and practical experience with ecological and agro-ecological systems will be better positioned to manage these systems (other things being equal). The issues for an agrarian ethic like Thompson's are derived from the following considerations:

(1) practicing agriculture or living on the land is not a sufficient condition for creating an attitude of care or reverence for nature or the kind of knowledge and practical experience that is conducive to managing natural systems in a way that can effectively address modern agricultural problems (especially the ones we haven't solved yet!).

(2) It is plausible to suppose that certain kinds of training and experience are necessary conditions for preventing fear of nature or indifference towards it and promoting a fascination with and love for it. A similar point holds for communitarian values.

(3) This training and experience seems equally possible for people living in agricultural and urban contexts. And it seems as if central features of this training and experience will be: (a)

highlighting nature's aesthetic qualities and scientific intrigues; (b) encouraging interactions with nature that are fun, exciting, interesting, or otherwise associated with positive psychological states; (c) fostering a sense of kinship with elements of nature that centrally involves a sense of the mutual requirements/ interests of plants, animals, and human beings as well as a sense of dependence on fundamental ecological processes; d) instilling knowledge about the impacts of one's actions and collective patterns of action on natural systems; and e) using technological innovation as a buffer from environmental threats to our livelihoods and safety, instead fostering collaborative and mutualistic relationships with natural systems.

The thing to notice is that making agriculture a centerpiece of communitarian and ecological values requires that we motivate these values on rational grounds and demonstrate empirically the ways in which agriculture can be organized to help reproduce them. But idealized images of family farmers embedded in close communities look more like nostalgic musings than widely endorsable reasons to accept communitarian and ecological norms, or useful roadmaps to setting up agriculture as a centre for environmental and communal value creation.

4.2.3 Agrarian Impotency

The final hurdle for agrarianism is to show that it is not possible to articulate or effectively endorse the kinds of communitarian and environmental norms central to agrarian ideals without reference to something like yeoman farm experiences. The challenge, here, is that many of the norms and values central to agrarian, place-based ethics can be articulated and motivated using theoretical tools from virtue ethics, pragmatism, environmental ethics, and communitarianism. Agrarian insights about the problems with consumerism, the importance of practical engagements with the natural world for the inculcation and maintenance of sensible environmental values, and the need to be clear about the value commitments that are informing our conceptions of agricultural sustainability can all be explicated without reference to agrarian ideals such as farmers as the best citizens, communities of yeoman as the best managers of communal and environmental ideosyncracies, or farm work as uniquely edifying and satisfaction-producing. Such ideals seem best conceived as contingent expressions of these more general values – as what we want farming to be like on the basis of these values – rather than as necessary features of a society that sustains them or as practical guides to transitioning to such a society.

4.3 Persistent Disagreements

At root, both Thompson and DeGregori have strong pragmatist tendencies. Pragmatism's eschewal of ethical universalism/ foundationalism, and embrace of proceduralism means that it is difficult to see how either could construct an argument that rules out the other's claims. At best, persistent cites of disagreement can be viewed as fodder for public discourse. In what follows, I condense key cites of persistent disagreement along with the strategies employed thus far to try to mitigate them. The next section begins the discursive task of building bridges between these positions by bringing together insights provided by each. The persistent cites of disagreement are:

- 1) The scope of the moral principles that apply to farmers' decision-making:

DeGregori seems to be fine with economic considerations as the primary desiderata. But, as we have seen, this seems reasonable only to the extent that farmers are operating within a market that properly internalizes environmental and social costs of production. In this case, a properly structured market is an appropriate guide for farmers' decision-making because it embeds our political ideals.

Thompson, on the other hand, sees farmers as the generators of environmental and social values. In this case, farmers are fundamental to the process of properly managing economic systems that guide consumption habits. However this position seems to invoke a stipulative account of the way practices inform moral psychology.

- 2) Issues of environmental value:

DeGregori is conceptualizing the land as a resource, the use of which is to be minimized through the application of science and technology. The problem, here, is that many of the biogeological systems (and the ecological processes that form part of them) are not aptly conceptualized just as resource inputs that can be replaced through the application of technology. They are fundamental conditions for agriculture. And it is often the case that conceiving of agriculture's broad, cumulative impact on large, biogeological systems requires that we treat ecological processes on the land as elements in renewable resource systems. Here, it is the functional integrity of these system that agriculture must safeguard, not just resource quantities and technological capacities sufficient for ongoing production.

Thompson, on the other hand, is conceiving of the land as a place, whose value and significance is closely tied to the cultural habits and traditions of the people that derive their livelihood from it. This means that applying technological solutions to production and productivity problems threatens to disrupt the habits and traditions that wed people's interests to the land. This is especially true to the extent that technological solutions disrupt the organization of social systems and structures of dependence that align individuals' interests with environmental quality and the good of the community. The trouble is that this picture seems to rely on a romanticized picture of traditional cultural practices and a dubious claim about the way in which certain forms of dependence create attentiveness and care.

3) The connection between science and technology, and ethics.

For DeGregori, moral progress is implicit in technological progress. This is due to the structure of science, which embeds diversity, creativity, and rational deliberation as crucial values for problem-solving and eschews justifications that invoke traditions. Scientific practice is the model of instrumental reason that promises to improve our norms as we require them to solve practical problems for human flourishing. I problematized this position by claiming that it is based on the derivation of an ought from an is: it uses science's morally praiseworthy successes in dealing with past problems to bolster the claim that science can tell us what we ought to find problematic about modern agriculture.

Thompson recognizes that implicit, collective norms structure what counts as a worthy problem. In particular, the notion that science is a model purveyor of moral progress ignores the way in which science responds to social goals formulated in problematic neoclassical economic terms. More broadly, thinking of moral progress in instrumental terms misconstrues social issues like community cohesion, responsiveness to injustices and inequalities, collective identity formation, and consensus building. Navigating these issues often involves speculative ethical thinking and the formulation of narratives and ideals that can be the source of shared senses of purpose and motivation. Here, we are faced with the difficult task of establishing shared values, not the task of trying to achieve pre-established ones. I have criticized the agrarian approach on the basis

that it attempts to found an agricultural ethic on narratives and ideals that suffer from historical inaccuracy and romanticism.

4.4 Conclusion: the Salvage Yard

Are there ways to mitigate these disagreements?

4.4.1 Issues of Scope

Much of Thompson's opposition to market-based agriculture is directed at a neoclassical model that either claims to be morally neutral or to be morally minimalistic, primarily protecting individual freedoms and property rights. However, the central distinguishing feature of DeGregori's institutional economics is that it seeks to understand and control the operation of markets using more comprehensive sociological and psychological tools than the simplifying assumptions of neoclassicism. Although I do not think that DeGregori's focus on the instrumental/ ceremonial distinction gets us very far, I think there are two other routes to criticizing the moral minimalism of mainstream economics for institutionalism that can work towards addressing some of the problems with IA identified by Thompson. One is to claim that there are a certain set of values, above and beyond negative rights and freedoms, that can achieve universal (or near universal) assent on due consideration. These might include positive rights and individual character traits that are widely realized by people who have active social lives and are happy and well-integrated members of society. The other route would be to point out ways in which certain positive rights and individual character traits are implicitly necessary for markets not to fail, even where we conceive of market failure in terms of the protection of basic rights, freedoms, and welfare interests. In both cases, the idea would be to show that the assumptions made by classical and neoclassical economists and the policy suggestions derived from models based on these assumptions are inadequate a) to achieve social goals that are just as fundamental to our political culture as are the ones motivating economic analyses and interventions, and/ or b) to achieve even the social goals explicitly endorsed by economists.

This changes the issue from one of devising a new set of agricultural values to devising economic policies and incentives that better incorporate the full range of existing ones. Such an approach constitutes a paradigm shift in economics that explicitly acknowledges the discipline as engaging social engineering problems at the intersection of philosophy, economics, sociology, psychology, and ecology. Viewing agricultural activity through such a lens broadens the conceptual tool set that can be used to address modern agricultural problems. Although I do not

have space to engage this approach in any great depth, I would like to surmount a barrier posed by environmental ethicists like Thompson with place-based affinities.

There is a common assumption among place-based ethicists, best articulated by Mark Sagoff, that since economic values and political values are logically distinct, each factors into a separate domain of inquiry and action. I think of this as ‘the separation thesis’ since it is generally taken to mean that we should not collapse political and economic contexts of choice either in our individual lives or in our academic work. The idea seems to be that economic choices constitute a legitimate domain of subjectivity and freedom where choices are made according to individual preferences, whereas political choices are the stuff of collective deliberation and justification. These two realms of human action overlap in that we often have to impose political regulations on freely operating markets in order to prevent markets from causing morally egregious outcomes (market failures). But we ought not to legislate individual economic choices or replace democratic legislative processes with measurements of individuals’ preferences.

There are two related problems with this thesis. The first is that it obscures the inherently political nature of economic transactions. Buying and selling are relationships in which the actions of one person impact the wellbeing of others. It may be, for example, that choosing to buy the lowest priced summer fashion items means that I am supporting a factory in Bangladesh that badly mistreats its workers. However, the political nature of economic choices is often obscured in two ways. First by theoretical constructs like the invisible hand, Pareto optimality, or Kaldor-Hicks efficiency, which posit mutual welfare increases (actual or possible) as necessary accompaniments of economic choices under certain idealized conditions. And second, and by marketing campaigns that focus consumers on the ways goods or services can satisfy self-serving preferences they might have as opposed to serving collective ideals that are worthy of their support. But since it is true that one’s economic choices often do contribute to rights abuses or human suffering, consumers and producers must be held accountable for and answerable to the effects of these choices.

The second issue is that the separation thesis obscures the role that reasonable pluralism plays in the political process. Individuals often approach collective deliberation with a focus on their own and their community’s interests. And this is a legitimate part of the collective bargaining process. The trick is to align the interests of individuals as much as possible and to

balance those interests that can't be aligned in a way that all can agree is equitable. It is not clear, however, that the logical difference between individual preferences and political values amounts to an ontological one; that is to say, it is not clear that all political norms are directed at social goals while all individual norms are self-interested, or something of the like. One might have a strong personal interest in justice. And one might endorse legislation because it provides oneself with the best package of benefits or services consistent with the approval of others. It is not the case, therefore, that we can draw mutually exclusive lines around the kinds of values that can gain political traction and the kind that are relegated to individual interests. Nor is it the case that we can say that economic reforms ought to come from the operation of political bodies, or that political reforms ought to come from the grassroots interactions of individuals.

What this means for pragmatist-leaning folks like Thompson and DeGregori is that institutional mechanisms that foster deliberation and justification, that increase accountability and transparency, and that place people in contact with relevant information and differing evaluative perspectives are equally important in contexts of economic and political choice. And this means that properly structured economic relationships and transactions should generate and reinforce values relevant to modern agricultural problems.

This interpretation of the project of economics in general, and agricultural economics in particular, is augmented by pragmatist insights about the way in which practically-embedded social norms channel people's attention and action towards particular ends (as well as providing the context necessary for intelligent normative change). Making practices that are aimed at morally praiseworthy goals economically viable is a critical means for encouraging the formation of praiseworthy dispositions and, eventually, virtues. This is because making the advancement of social goals a means to economic gain sets up a basic level of attentiveness to these goals and motivation to advance them among citizens. Hence, subsidizing agricultural programs that balance production goals with distributive, ecological, and community wellness goals is an important means for developing a cultural attentiveness to these broader social goods.³⁶

³⁶ Indeed, it seems as if there is a route based on these premises to something like Thompson's conclusion that agricultural practices ought to factor into our lives in ways far beyond the transactions at the grocery store. Such a conclusion is equally supported by a focus on the need for agricultural innovation in something like the following way: "throughout the... centuries of civilization, agriculture remained at the forefront of [technological] innovations, in part no doubt, because it also occupied the head and hands of the majority of civilization's denizens" (Boyd 2005, 203).

The problem for those with a democratic, proceduralist bent is that it seems like economic interventions will be justifiable only to the extent that a) people perceive a mismatch between their economic behaviour and their political values, and b) they want to bring their economic behaviours in line with their political values, though they need help with the means and motivation for doing so. Economic policies that do not have such popular support appear arbitrary and totalitarian.

One might want to simply bite this bullet. But one way to deal with public apathy towards environmental and social values, and resistance to government interventions on their behalf is to try to show that current economic structures and ideologies work against our acknowledgement of and responsiveness to these values. Such an argument would show, for example, that current market structures and ideologies actively obscure the distasteful consequences of our economic choices, buffer us from having to justify these choices to those affected by them, and actively manipulate us into focusing myopically on our subjective wants. I take many of the insightful criticisms of capitalist agriculture offered by Thompson as engaging this kind of project.

Although such an approach does not absolve individuals and firms from the responsibility to foster transparency, accountability, and critical engagement, special emphasis can be placed on creating institutional mechanisms that build these values into the structure of markets (e.g. by requiring firms to practice triple bottom line accounting and make their results public; by implementing taxation or cap and trade systems for externalities; by instituting strong sanctions against false or misleading advertising; by developing subsidy programs and public investments through binding consultations with citizens). Moreover, the neoclassical focus on freeing economic agents from external intervention shifts to a focus on building their capacities to understand, predict, and manipulate markets, marry economic security with the achievement of other personal and political values, facilitate communication and collaboration with other stakeholders, and the like. Such an approach eschews any categorical moral distinction between economic contexts of production and consumption, and political contexts of regulation and economic management. In this way, ethical space is made for reconceiving a dollar as a vote, corporate responsibility as extending to social and environmental systems, or a farmer as a steward of the land's value without privileging the experience of members of a particular kind of institution or saddling them alone with the obligation to cause change. We are all in this together.

4.4.2 Issues of Environmental Value

One way to frame this disagreement is by placing Thompson on the side of ‘functional integrity’ conceptualizations of sustainability and DeGregori on the ‘resource sufficiency’ side. Thompson prefers the ‘functional integrity’ approach for two reasons: (a) he thinks it is more amenable to clarity regarding analysts’ normative assumptions, and (b) he thinks it turns our attention to increasingly holistic levels of analysis. Because of this holistic focus, he thinks the functional integrity framework jives more closely with the kind of place-based agrarian ethic he is trying to revitalize. DeGregori invokes basic ethical considerations about human rights and welfare to justify his endorsement of resource-augmenting and creating technological advancement. I think the opposition is a false dichotomy.

In the first place, the ethical adequacy of either of these models, I suggest, implies a choice about the nature of the salient threats to a system in question. Analyzing a system in terms of its functional integrity is appropriate only to the extent that the necessary inputs to a system can be safely assumed to remain constant or have a predictable rate of change. We only care about the ability of a car engine to go on running if we know that we will have enough gas to fuel it. Conversely, it makes sense to focus on the resource sufficiency of a system only to the extent that we can assume that it is set up in a functionally integral way. If our engine won’t run, then the amount of gas required is of secondary concern. So although DeGregori does focus on resource sufficiency measures of sustainability, he does so primarily due to his confidence in the functional integrity of an agricultural system based in science and technology. It is science’s internal ability to cope with resource shortages that makes it sensible to focus on the current productivity of IA.

Thompson, on the other hand, associates IA more closely with a neoclassical economic system that he sees as unresponsive to environmental problems. Moreover, he conceives of the fundamental resources for agricultural production as coming from renewable resource systems. Although he acknowledges the scientific inaccuracy of supposing that undegraded natural systems achieve a perfectly harmonious stability, he is confident that these systems can be stewarded so as to maintain stable levels of resource production. This capacity of renewable resource systems to maintain a steady supply of fertile soil, clean air and water, and biodiversity makes it sensible to focus on organizing our agricultural production system in a way that maintains attentiveness to the integrity of these systems. And such attentiveness, Thompson

thinks, comes not from cold, quantitative measures of resource stocks and rates of usage. It comes from incorporating natural places into our senses of collective identity and purpose, from having a practical sense of how we depend on natural systems to live well.

Of course the productive potential of a renewable resource system is determined partly by the kinds of technological means that we possess for transforming natural resources into units of human benefit. And place-based environmental values can be well served by innovation focused on using particular resources more efficiently or mitigating pollution. To me, it makes little sense to align oneself with one of these models of sustainability irrespective of a particular agricultural problem. This is because each model is appropriate under different kinds of circumstances.

Thus, in my view, Thompson and DeGregori are both partially right. Each one is focused on a particular set of agricultural problems, though each tends to overemphasize the importance of what they see as problematic. Degregori's framing of the problem of agricultural sustainability as primarily a productivity problem works if our focus is on figuring out how to conserve or eliminate the use of a particular resource. But as we have seen, not all problems relevant to agricultural sustainability can be characterized in this way. Conversely, Thompson's focus is primarily on how cultural habits and practices, enabled by particular technological modes of production, reproduce dispositions to care about and be motivated to act in the interest of ecological integrity. His focus works well in cases where economic forces disrupt individuals' practical ability to care for the land or persistently focus their attention and motivation away from doing so. And, thinking of yeoman agricultural practices as embodying sensible environmental values allows him to characterize the shift from yeoman to industrial farming as a wholesale assault on agricultural sustainability in this sense. However, yeoman agricultural values are as much or more in need of reform as modern industrial ones. And focusing on the way in which technologies structure our interface with the natural world, attaching virtue to some and vice to others, does little but polarize a conversation whose principle object is to reconceptualize, in light of history and modern experience, the kinds of norms that we want to govern our use of current technologies and our creation of new ones.

My tactic thus far has been to focus on the legitimacy of each approach relative to specific kinds of agricultural problems. I will defer until the next section fundamental questions of environmental value in order to draw two lessons from the preceding discussion. One is that being clear about evaluative assumptions is important at two levels: first at the level of choosing

the model that is most appropriate for understanding a given environmental problem, and then again at the level of defining the system in question. When choosing which kind of model to use, we will operate with a set of assumptions about what the most pressing threats to a system are as well as assumptions about what we expect the best means for dealing with these threats will be. Our sense of the most dire threats and the most reasonable routes to a solution may incorporate assumptions about human nature, about how to prioritize human needs and wants, about the kinds of environmental and social goods at stake, and the like. Being clear about how such assumptions are informing our choice of methodologies and theoretical tools is critical to our ability to have clear and open discussions about sustainability.

The second lesson is that clarity is equally important and, contra Thompson, equally possible within both models. For functional integrity models, drawing *system boundaries*, defining upper and lower *performance thresholds*, and identifying the *relevant properties* of systemic elements for maintaining minimal performance are all sites where researchers' normative assumptions impact their theoretical choices. For resource sufficiency models, it is important to be clear about the valuable product or service for which a resource is considered a production factor and whether the resource serves other purposes, to whom the product or service is valuable, the relative value among others of the product or service, and how a time period is arrived at over which the product or service must be maintained. Engaging these sites of normativity clearly and in depth will yield sustainability measures that must rely on social goals and defensible evaluative choices in just the same way as in functional integrity models.

4.4.3 Issues of Moral Progress

It seems right to claim that scientific institutions *can* be purveyors of moral progress, and have been in the past, when they are allowed to operate free from the invidious interests of self-serving corporations, governments, or individuals. However, it is not clear that DeGregori's instrumental/ ceremonial distinction is either an adequate explanation of this or a strong justification for accepting the way that scientists frame agricultural problems. Although this is not the place to enter into a philosophical consideration of the sociological features of academic science, it seems like a better explanation of science's moral success might include some of the following elements: that these institutions are responsive to public concerns and social goals; that they embody rigorous procedures of collective deliberation and justification at the levels of determining both the value of a research program and the empirical adequacy of methodological

choices and empirical claims; that they enshrine a strong commitment to humanistic values; and that they focus on providing the tools and management strategies to reduce the prevalence of inequality and zero-sum competition.

But even accepting that properly organized scientific institutions are crucial sites of moral progress, Thompson's work highlights two further problems. One is that even with the technology and information necessary to address environmental problems, publics lacking care and concern for the environment or responsiveness to collective values will not be easily motivated to act. The other problem is that there is a justificatory gap between a focus on procedural instrumentalism and substantive humanistic and environmental values.

My discussion of economics above was an attempt to sketch the kinds of reforms that might help to address public aversion to policies and technologies aimed at achieving social and environmental goals. Further, the hope is that such reforms can foster a public culture of deliberation that can be a source of social goals and environmental values. The point, however, is that, whereas we need the public to be informed about agricultural production practices and related environmental problems in order to be able to address sustainability in a constructive way, it is not clear that agrarian ideals play a necessary role in this process. Indeed, insofar as such ideals embody a baseline technological conservatism and a nostalgic yearning for a simpler time, they will not be well positioned to help us understand and navigate modern, technologically intensive, globalized agricultural systems. Under such conditions, public sentiment can end up unilaterally supporting agricultural production systems whose labour-intensive, artisanal production methods cater largely to a wealthy elite who have the luxury of paying high food prices for the prestige and personal satisfaction that they provide. But just because such production systems look 'traditional' does not mean that they are environmentally benign or that they provide a model for reforming the agricultural system as a whole.

The second problem is a much harder one: it may be the case that, even with the kind of economic reforms suggested above, there remains widespread disagreement about the nature of environmental values and how they ought to be weighed against anthropocentric ones. For example, the economically minded like DeGregori may persistently rank the welfare interests of human beings above measures protecting agro-ecological quality or animal welfare. There may be several ways to mitigate these kinds of disagreements. The first way is technological. Using technology to remove the conflict between anthropocentric and environmental goods is a critical

way to sidestep these issues. For example, consider the disagreement between those who oppose eating meat for animal rights reasons or in light of animal agriculture's role in climate change and those who see meat eating as a legitimate welfare interest, the freedom to satisfy which is fundamental. In such a case, a product that could satisfy the welfare interests of meat eaters without the need to raise animals (see Beyond Meat™), or management strategies that could incorporate humane animal production into a system that produced net carbon storage in soils would be good ways of sidestepping the disagreement. Second, focusing on ways in which the broader value system of opponents overlap and can converge on practical solutions minimizes the importance of differences, especially where these are theoretical in nature. Although the process of finding convergences on practical solutions to specific problems is a long and involved one, I will conclude by offering a set of overlapping ideals that I think can gain assent from both Thompson and DeGregori, in light of the analysis presented above, and that can form the foundation for constructive discourse in pursuit of concrete policies and technological innovations. These are:

- (1) the moral fundamentality of food sufficiency and availability for the food system as a whole, including as a norm for researchers, consumers, producers, processors, and distributors.
- (2) the importance of addressing environmental problems associated with agriculture such as climate change, nutrient pollution, pesticide contamination, soil erosion, biodiversity loss and the like, as well as labour and animal welfare problems.
- (3) a view of consumer culture, which is associated with the neoclassical conception of economic agency, as a barrier to solving these environmental problems. Minimally, the reason for this is that consumerism can foster insensitivity to inequality and human suffering as well as the plight of future generations.
- (4) an acceptance that many modern industrial technologies, such as the use of machine work, nutrient inputs, irrigation technology, and improved germplasm, will continue to be important for agriculture to satisfy the sufficiency criterion into the future.
- (5) an acknowledgement that modern agriculture needs to aim at reducing the use of fossil fuel energy, nutrient inputs (especially synthetic nitrogen and phosphorous), ecologically damaging pesticides (such as neonicotinoids or DDT), soil-erosion-causing management practices, and wild ecologies critical to the production of essential ecosystem services

like carbon cycling, nutrient cycling, hydrological cycling, climatic stability, and the maintenance of biodiversity. General strategies for doing this include making existing farming more ecologically benign and productive, using urban land for food production, and managing wild ecosystems to be more productive of particular goods and services. To use the kind of conciliatory umbrella term adopted by the FOA, think of these as strategies for ‘ecological intensification.’

- (6) An endorsement of science-based approaches to environmental problems that embody complex economic and ecological models for predicting and coordinating our understanding of and approach to them.
- (7) An acknowledgement that concerted research as well as widespread public engagement with agricultural issues will be required to address modern agricultural problems. We will, in other words, need to dedicate considerable public attention and resources to devising, testing, and evaluating new ecological intensification technologies and management systems.

The upshot of these convergences, to my mind, is that the antipathy between industrial and alternative agricultural philosophies can be greatly diminished. And a list of shared ideals can be generated, which can provide justification for the following kinds of initiatives: research programs and economic mechanisms that get scientists and the public engaged with agricultural problems; regulations, subsidies, taxes, and other economic measures to curb environmentally and socially harmful agricultural practices; programs and incentives for redistributing global wealth and developing worldwide ecologically intensified agricultural systems; the creation of discursive space amongst producers, consumers, distributors, and regulators; educational programs regarding food production and the impacts of consumer choices on individuals, communities, animals, and ecological systems. Finally, I hope to have made justificatory space for measures of agricultural productivity that account for its ability to achieve a number of the ecological, social, and production goals listed. I also hope to have shown that agricultural economics ought to focus on designing market mechanisms that make agricultural practices more profitable to the extent that they can achieve more of these to greater degrees.

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